FACTORY

MANAGEMENT AND MAINTENANCE

JULY 1946

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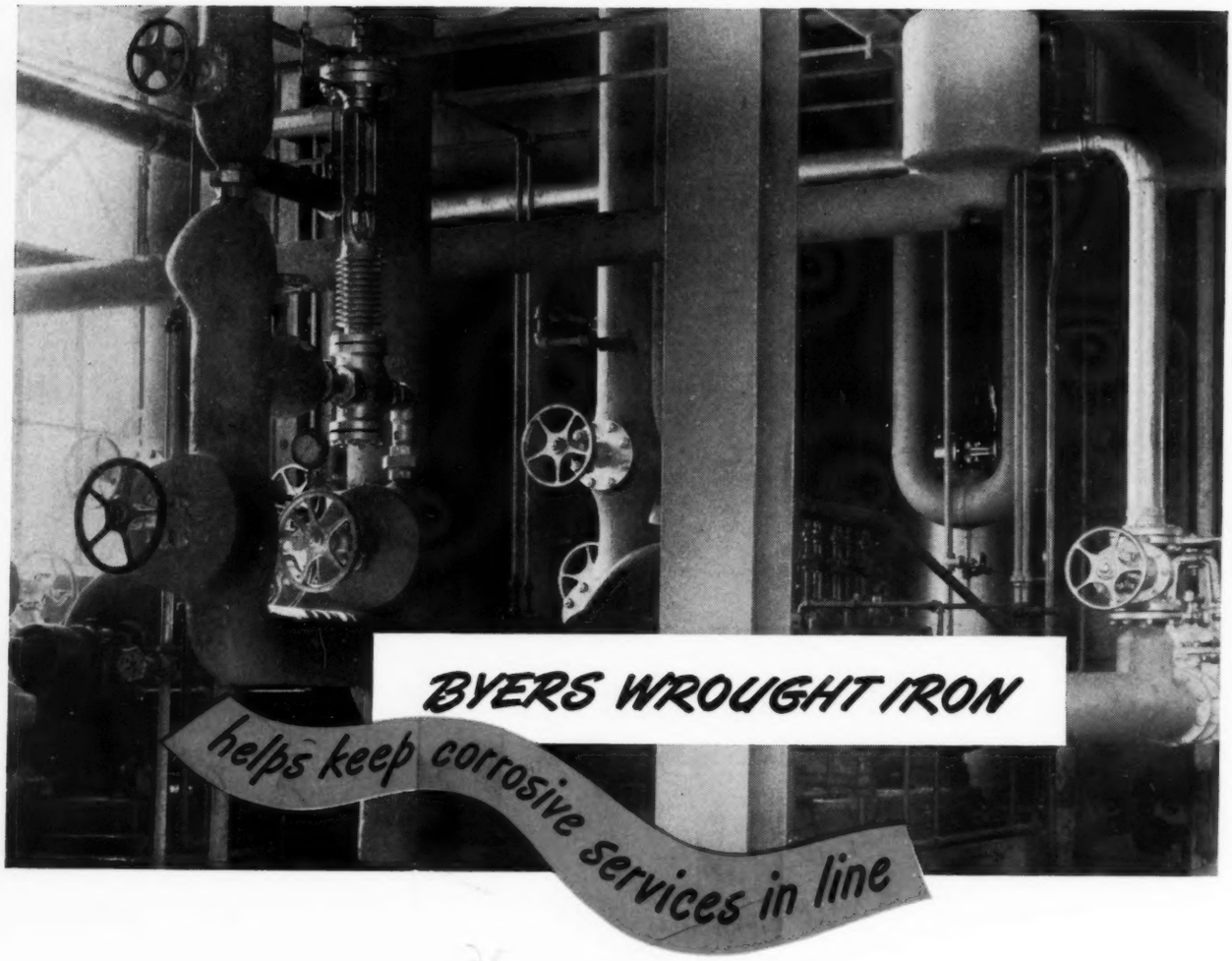

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JULY, 1946

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production • maintenance • labor management

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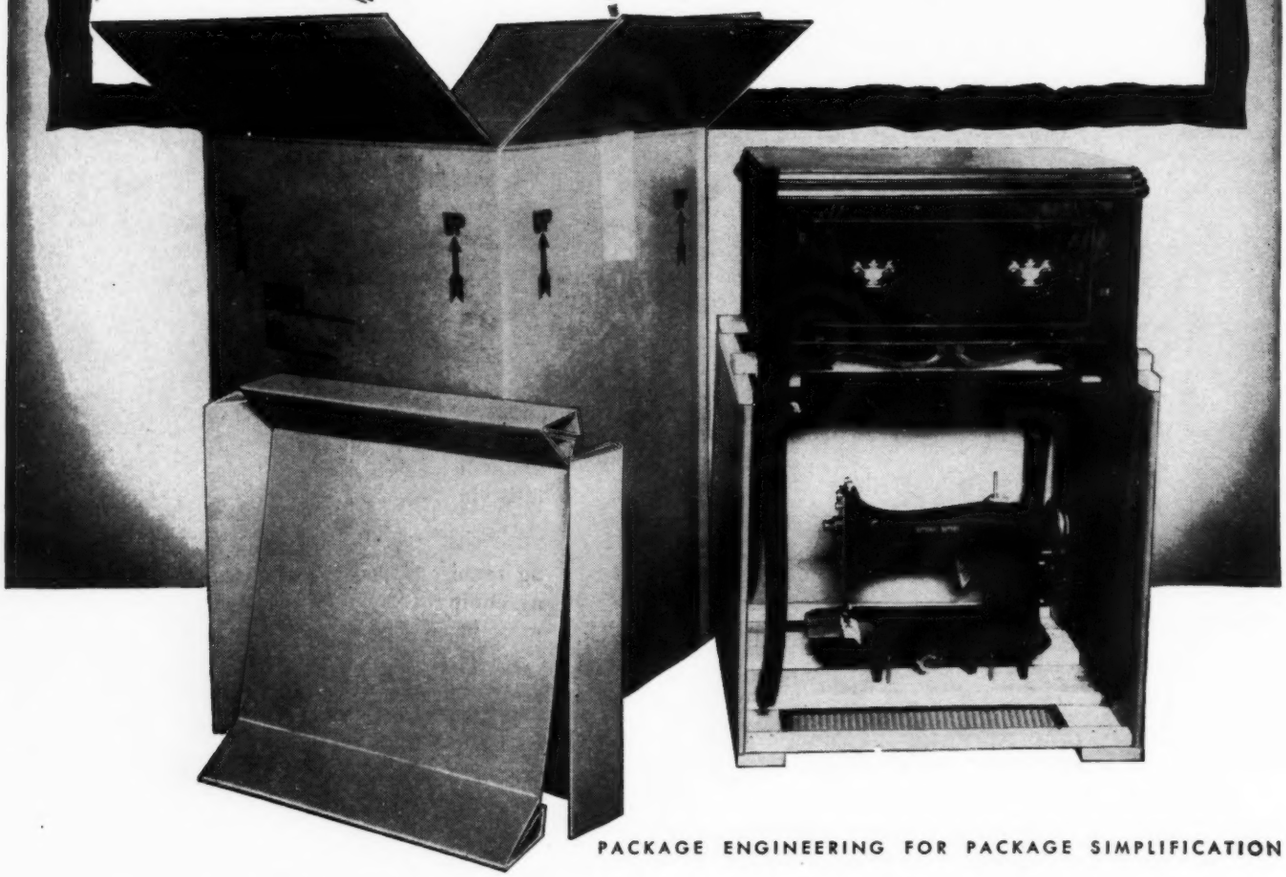

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FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

MANAGEMENT'S OUTPUT-PER-MAN-HOUR OBLIGATIONS

Inherent in its position of responsibility is the obligation of management to carry out a dual procedure with the objective of securing increased output per man-hour of workers.

One part of this procedure is to provide the equipment and methods by proper application of which maximum production can be secured.

The other part is to engender in the workers the desire to do their part in effectively using the equipment and methods.

Without highly productive equipment and without the right methods, the worker can do little. The steady increase of output per man-hour (from an index figure of 50 in 1909 to 125 in 1939) came about principally as the result of technological development. That always should be the case; the production burden should be borne by machines.

But the most highly productive equipment in the world contributes nothing to output per man-hour if it is not operated. And when it is operated only part-time, or inefficiently, it contributes only proportionate output.

To secure high-production equipment and adopt effective methods is relatively easy. It is a mathematical, dollar, and delivery proposition.

Inducing the worker to want to work is something else. He can find what to him are convincing reasons why he shouldn't. He'll work himself out of a job. His rate will be cut. The company will make too much money on him. New machines will be brought in to take the place of workers, maybe himself among others.

By and large, his reasons aren't sound. Increased output per man-hour creates jobs. Most manufacturers don't cut rates. Few companies make large profits. More productive equipment means more employment. But he needs to be convinced.

The company that has its house in order as to rates and technological unemployment will find the present an appropriate time to try to build in the worker the desire to contribute to full output.

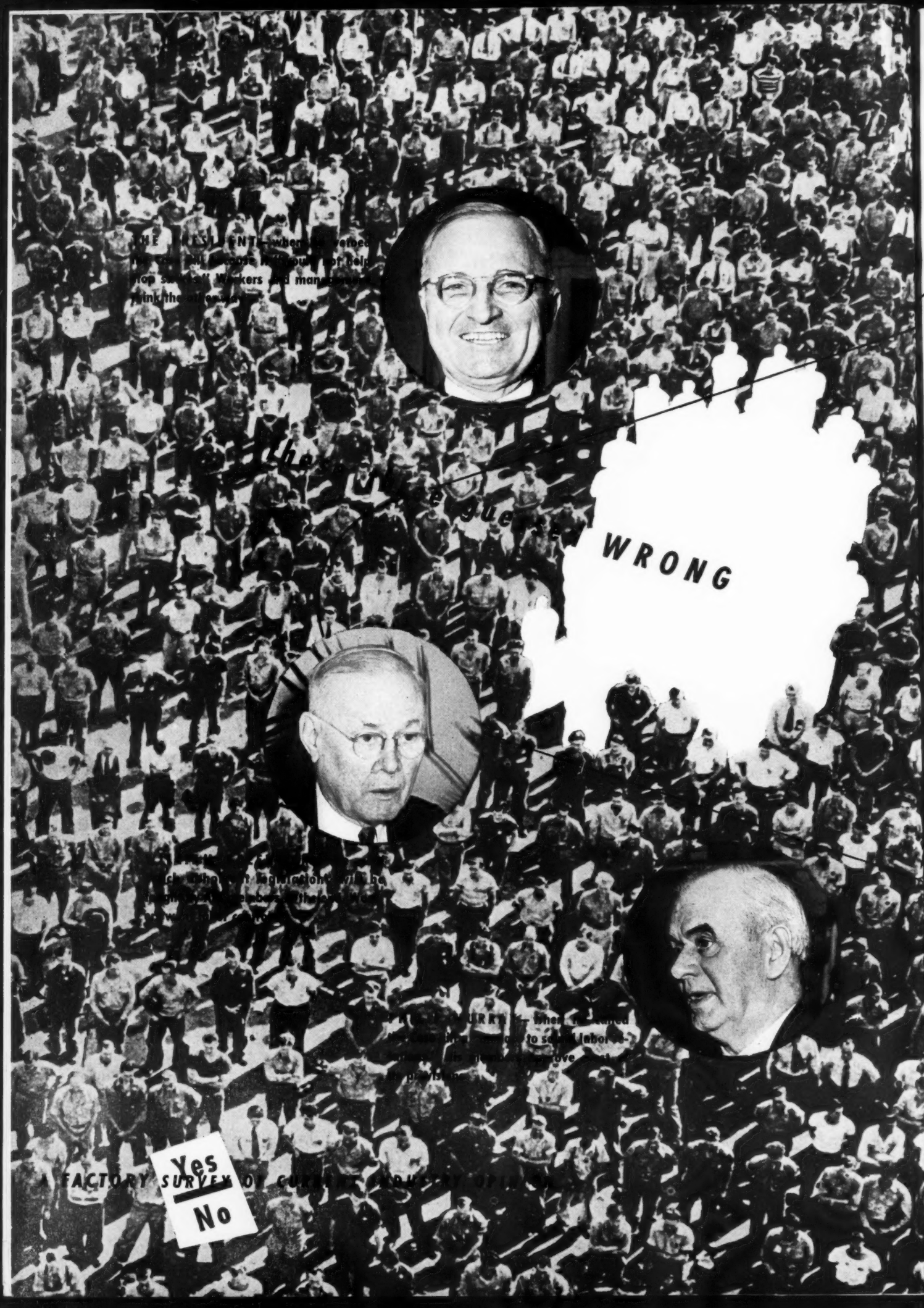
Now, more than at any time in recent years, management will find workers receptive to information about the economic facts of life.

FACTORY's worker polls show this to be true. The American worker is basically conservative and cooperative. But the polls show, also, that he is influenced by the people who take the trouble to try to affect his thinking.

Too long has management left to labor leaders and Communists the privilege of telling the worker what industry is and what it does. Basic truths have been lost sight of, among them the fact that people have things only when they produce them.

It is an economic and social obligation of industrial management to do all that it can, not only to provide productive tools and methods, but also to make workers want to use them fully.

L C Morrow


WRONG
Yes
No

HOW WORKERS AND MANAGEMENT STAND ON LABOR CONTROLS

Both workers and management in American industry want legislation to control strikes and to make unions responsible under the law.

But there will be only limited acceptance of President Truman's request for drastic emergency powers if they become law. His proposal to draft strikers, in particular, is repudiated by powerful majorities of management and of union members, although 53 percent of non-union workers favor it.

And vetoing the Case Bill was a major mistake for the Administration. Most of its provisions are deemed necessary by both management and workers in the manufacturing industries.

Scoring Mr. Truman's labor-control proposals as wild pitches and his veto of the Case Bill as a foul ball, the above conclusions come from a nation-wide survey of both management and worker opinions of major legislative proposals. The survey was made for FACTORY by the McGraw-Hill research staff.

The workers' poll, made through personal interviews with workers accurately sampled geographically, by union affiliation, by age, by sex, and by race, is representative of worker opinion in the manufacturing industries.

Management opinion was compiled from a mail survey of members of top management distributed geographically over the country and through the major classifications of the manufacturing industries.

What chance the Administration will have of controlling the wave of strikes expected next fall and spring is shown in the opinions of workers and of management on the emergency powers Mr. Truman requests. Opinion is divided on

how workers and management feel about Truman proposals

	WORKERS	MANAGEMENT
draft workers	51% No	61% No
revoke NLRA rights	55% No	91% Yes
penalize management	58% Yes	80% Yes
penalize labor leaders	52% Yes	81% Yes
seize profits	48% Yes	95% No
enjoin labor leaders	60% Yes	97% Yes

COLOR INDICATES AREAS OF AGREEMENT

FACTORY'S *box score of worker-management opinion on Truman and Case Bill proposals*

		MANAGEMENT		ALL WORKERS		
		Yes	No	Yes	No	No Opinion
TRUMAN PROPOSALS	1. Do you think the President should have authority to draft workers into the Army when they refuse to work in struck plants which the Government has taken over?	39	61	39	51	10
	2. If workers refuse to work in plants taken over by the Government, should they lose seniority rights?	91	9	35	55	10
	3. Should *management officials* who interfere with the resumption of work in plants taken over by the Government be fined or imprisoned?	80	20	58	26	16
	4. Should *labor leaders* who interfere with the resumption of work in plants taken over by the Government be fined or imprisoned?	81	19	52	33	15
	5. If the Government takes over a plant during a labor-management dispute, should profits from operation while under Government control go to the U. S. Treasury?	5	95	48	38	14
	6. Should courts have the authority to issue injunctions against union leaders who interfere with the operation of plants taken over by the Government?	97	3	60	27	13
CASE BILL	7. Should there be a federal mediation board to step into disputes and forbid strikes or lockouts for 30 days while seeking to adjust differences between employer and labor?	85	15	86	9	5.
	8. Should it be permissible to sue unions for breaking their contracts with employers?	98	2	69	19	12
	9. Should it be permissible to sue employers for breaking their contracts with unions?	98	2	73	14	13
	10. Do you think supervisors and foremen should be prohibited from joining a workers' union?	92	8	37	52	11
	11. Do you think supervisors and foremen should be prohibited from forming their own union?	57	43	23	67	10
	12. Should employers be prohibited from contributing to worker-welfare funds which are controlled exclusively by unions?	90	10	23	63	14
	13. Do you think the Government should create fact-finding boards to undertake settlement of labor-management disputes?	45	55	89	7	4
	14. Do you believe there should be a compulsory 60-day cooling-off period before a strike could be called, the 60 days to be used in an effort to settle the controversy?	92	8	78	16	6
	15. Should the Government set penalties for workers who interfere with the movement of goods in interstate commerce?	97	3	59	22	19
	16. Do you think a striker who uses violence while picketing should lose his rights as granted under the National Labor Relations Act (the Wagner Law)?*	98	2	66	22	12

*Not included in amended bill vetoed by President

UNION WORKERS			NON-UNION WORKERS		
Yes	No	No Opinion	Yes	No	No Opinion
30	61	9	53	34	13
30	62	8	45	42	13
55	29	16	63	20	17
47	40	13	61	22	17
52	38	10	42	40	18
53	33	14	73	15	12
84	11	5	89	6	5
65	23	12	76	11	13
72	17	11	74	10	16
40	52	8	33	52	15
21	72	7	27	58	15
22	66	12	25	57	18
89	7	4	90	5	5
75	20	5	85	9	6
55	27	18	67	13	20
62	27	11	72	15	13

the emergency powers, as is shown in the response to FACTORY's questions:

1. Do you think the President should have authority to draft workers into the Army when they refuse to work in struck plants which the Government has taken over?

Only 39 percent of management and 39 percent of all workers agree with Mr. Truman here. The question also reveals a sharp cleavage between union and non-union workers. Only 30 percent of union workers approve the proposal, but 53 percent, a slight majority, of non-union workers are in favor. Because 67 percent of workers in manufacturing industry are unionized, however, their numbers are enough to make the all-worker response to the question a 51 percent majority *against* Mr. Truman.

Attacked frequently as undemocratic and un-American, this most controversial point of the Truman program clearly will meet the opposition of a majority of workers and management in industry.

2. If workers refuse to work in plants taken over by the Government, should they lose seniority rights?

A major point in the emergency powers program, this proposal is rejected by workers by a 55 percent majority, although management approves it by 91 percent. Union workers show the desire to defend their National Labor Relations Act rights by voting 62 percent against the proposal. But non-union workers *accept* it with a 45 percent response for, and a 42 percent response against.

3. Should *management officials* who interfere with the resumption of work in plants taken over by the Government be fined or imprisoned?

Workers and management agree on this question, although workers are more conservative than management. Workers approve by 58 percent, whereas management runs up an 80 percent majority in accepting this restriction.

4. Should *labor leaders* who interfere with the resumption of work in plants taken over by the Government be fined or imprisoned?

The parallel to question 3, this question, too, meets overwhelming acceptance by management and a majority approval of all workers. Union members, however, show loyalty to their leaders. Only 47 percent accept this restriction.

5. If the Government takes over a plant during a labor-management dispute, should profits from operation while under Government control go to the U. S. Treasury?

Disputed in management circles almost as much as the "draft workers" proposal, the profits question is rejected by 95 percent of management, although 48 percent of all workers, including a 52 percent majority of union members, approve it. The profits-to-Uncle Sam issue, hitting primarily at management's privileges, reveals the greatest disparity of all the sixteen issues between management's and workers' opinions. The percentage of workers approving it is almost ten times greater than that of management representatives voting "yes."

6. Should the courts have the authority to issue injunctions against union leaders who interfere with the operation of plants taken over by the Government?

how plant size influences worker opinion

The questions on w… workers in plants of different sizes differ most — and … ercentage of their "yes" responses

	Number of employees in plant size groups					
	1-100	101-250	250-500	over 501	All Workers	Management
1. draft workers	41	34	37	38	39	39
2. revoke NLRA rights	39	30	33	34	35	91
3. penalize management	58	51	54	60	58	80
5. seize profits	46	40	45	52	48	5
6. enjoin labor leaders	64	53	53	62	60	97
8. make unions legally responsible	68	62	60	72	69	98
9. make employers legally responsible	73	66	64	78	73	98
16. revoke pickets' rights for violence	67	57	67	65	66	98

THE THREE CHARTS ON THIS PAGE — breaking down worker opinion on important labor legislation proposals — reveal much to ponder.

Far more women than men, for instance, approve Mr. Truman's request for powers to draft workers who refuse to work in plants taken over by the Government. That's not too surprising, perhaps, but why should workers under 29 show a similar willingness to put non-cooperating strikers into khaki? Feminine thinking on these issues contrasts sharply with male opinion, giving public relations directors meat for thinking of their own.

Surprisingly, too, workers in the smallest plants and those in the biggest often agree in their thinking — and come closest to management opinion. It's workers in the plants with 100 to 250 employees who differ most from management in its thinking, indicating that proximity in the small plants and employee relations programs in the large plants do have an effect.

Younger workers, too, in the 29-or-under group, show a sharp difference in opinion from those 30 years old or older.

how men and women differ

The questions on which men and … en working in industry differ most — and the percenta… their "yes" responses

	Men	Women	All Workers	Management
1. draft workers	36	48	39	39
2. revoke NLRA rights	34	40	35	91
6. seize profits	49	41	48	5
9. make employers legally responsible	75	67	73	98
10. bar supervisors from workers' unions	38	31	37	92

how age influences worker opinion

The questions on which worke… different age groups differ most — and the percenta… their "yes" responses

AGE GROUPS:	Under 29	30-44	Over 45	All Workers	Management
1. draft workers	42	37	37	39	39
9. make employers legally responsible	71	73	76	73	98
11. prohibit unions of supervisors	26	21	22	23	57
15. penalize interstate commerce stoppage	61	56	61	59	97

Although aimed directly at unions, the proposal wins the acceptance of both union and non-union workers and the approval of 97 percent of management. Union and non-union members again differ in their thinking, 73 percent of non-union members accepting as against 53 percent of union members, although both show majorities in approving the measure.

With management and workers sharply divided in their acceptance of the Truman emergency powers proposals and with the two groups split on some of the points, Mr. Truman may have unprecedented difficulties with the labor trouble expected to come his way. Even if Congress gives the Chief Executive the powers he requests, he may have still more trouble in getting cooperation to make his program work than he had this spring. FACTORY's survey shows clearly that both sides want long-range control measures rather than drastic powers for the Administration, even if those drastic powers are temporary and become operative only after the Government has taken over a plant in the national interest.

The long-range proposals of the Case Bill, some of them under study by Congress for eight years and all but one of them included in the Bill which the President vetoed June 11, would make workers and management much happier, FACTORY's survey reveals.

Management accepts the Case Bill proposals with a better than 90 percent agreement on seven proposals, a majority acceptance of all but one. Workers, although they do not agree with management on four questions on minor provisions, show overwhelming acceptance of the major proposals.

Here's how workers and management look at the Case Bill provisions:

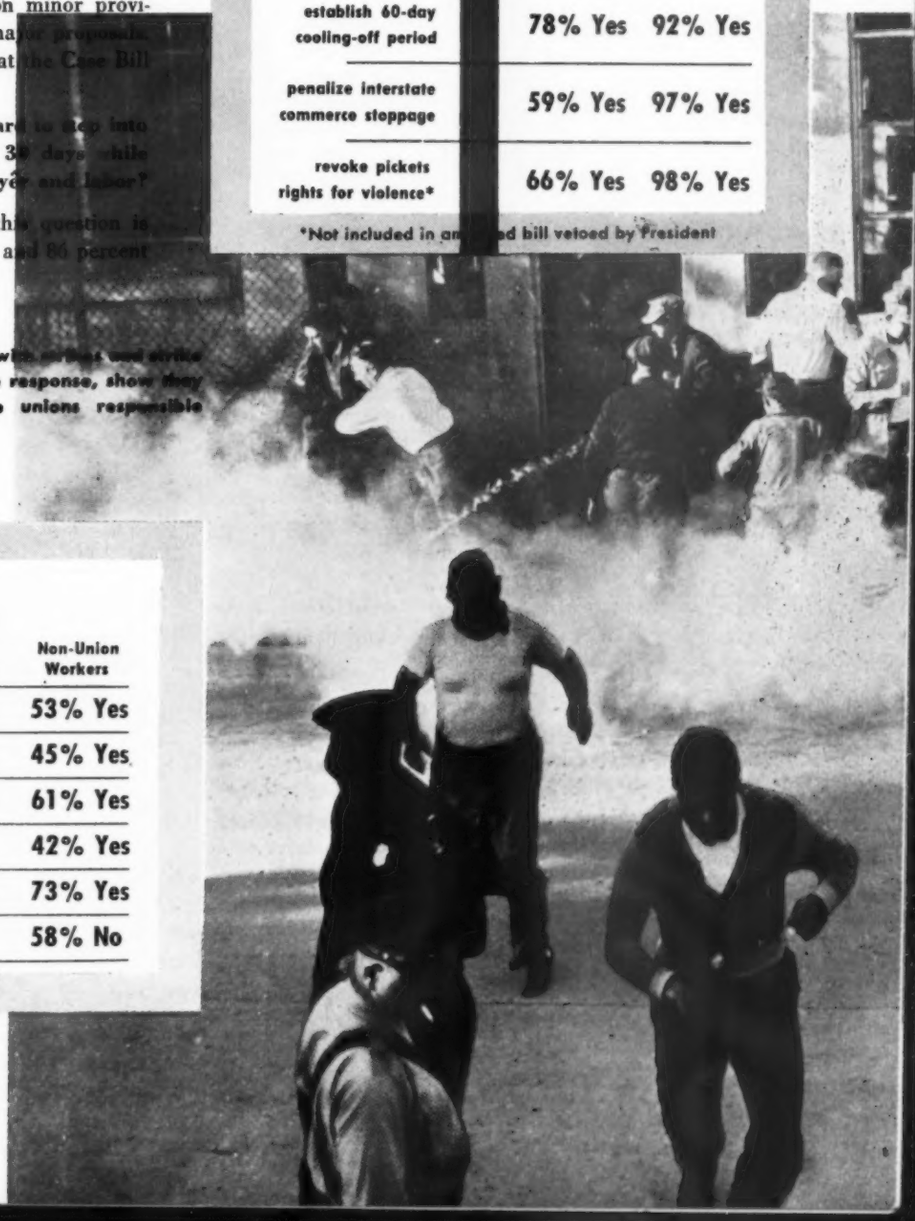
7. Should there be a federal mediation board to step into disputes and forbid strikes or lockouts for 30 days while seeking to adjust differences between employer and labor?

One of the major provisions of the Bill, this question is answered "yes" by 85 percent of management and 86 percent

how workers and management feel about Case Bill proposals

	WORKERS	MANAGEMENT
set up mediation board	86% Yes	85% Yes
make unions legally responsible	69% Yes	98% Yes
make employers legally responsible	73% Yes	98% Yes
bar supervisors from workers' unions	52% No	92% Yes
prohibit unions of supervisors	67% No	57% Yes
bar employer contributions	63% No	90% Yes
create federal fact-finding boards	89% Yes	55% No
establish 60-day cooling-off period	78% Yes	92% Yes
penalize interstate commerce stoppage	59% Yes	97% Yes
revoke pickets rights for violence*	66% Yes	98% Yes

*Not included in an[illegible]d bill vetoed by President



Not only management and the public are fed up with strikes and strike violence such as this. Workers, by a two-to-one response, show they want legislation to reduce strikes, to make unions responsible

union and non-union workers don't see eye to eye

	Union Workers	Non-Union Workers
draft workers	61% No	53% Yes
revoke NLRA rights	62% No	45% Yes
penalize labor leaders	47% Yes	61% Yes
seize profits	52% Yes	42% Yes
enjoin labor leaders	53% Yes	73% Yes
prohibit foremen's unions	72% No	58% No

of all workers, clearly indicating the desire of both sides for strike-control measures.

8. Should it be permissible to sue unions for breaking their contracts with employers?

Workers' desire for legislation to fix union responsibilities, putting a check on their own leaders, is shown in their 69 percent acceptance of this proposal. The point is approved by 98 percent of management.

9. Should it be permissible to sue employers for breaking their contracts with unions?

A Case Bill provision and included in FACTORY's survey to eliminate any suspicion of partiality on question 8, this point is approved by almost the same majorities of workers and management that favor question 8's provision that it should be permissible to sue unions for breaking contracts.

10. Do you think supervisors and foremen should be prohibited from joining a workers' union?

Workers, 52 percent of whom believe supervisors should be allowed to join workers' unions, disagree with management on this question. Management, visualizing a split in its ranks, agrees with the prohibition by 92 percent.

11. Do you think supervisors and foremen should be prohibited from forming their own union?

Management's 92 percent agreement on barring supervisors from workers' unions falls to 57 percent here. Evidently a large segment of management believes in the foreman's need for union protection in some cases. A high proportion of workers, 67 percent, believe that supervisors should have their own unions.

12. Should employers be prohibited from contributing to worker-welfare funds which are controlled exclusively by unions?

Aimed at funds such as the one John L. Lewis demanded for his UMW, this question, too, splits management and worker opinion. Management votes 90 percent *for* prohibition, workers 63 percent *against* prohibition. In the Lewis case, the point is academic; he got around it by including Government representatives (who will presumably be replaced by operators' representatives) on his welfare board.

13. Do you think the Government should create fact-finding boards to undertake settlement of labor-management disputes?

The sixth and last point of the survey on which workers and management's opinion split, the question saw management voting 5[illegible] percent against the boards, workers approving them by 89 percent. Here the difference in opinion probably comes from management's reaction to the fact-finders' almost universal rubber-stamping with the 18½-cent formula.

14. [illegible] you [illegible] be a compulsory 60-day cooling-off [illegible] ould be called, the 60 [illegible] be u[illegible] the controversy?

[illegible] part of the mediation board [illegible] 2 percent approval of management, 78 percent approval of all workers, clearly supporting the desire of both for legislation that will reduce the number of strikes.

15. Should the Government set penalties for workers who interfere with the movement of goods in interstate commerce?

The major issue of the "anti-racketeering" provisions of the Case Bill, this question in FACTORY's survey gets a 97 percent approval by management, a 59 percent approval by workers. Even union members accept it by 55 percent.

16. Do you think a striker who uses violence while picketing should lose his rights as granted under the National Labor Relations Act (the Wagner Law)?

Although eliminated from the amended bill vetoed by the President, this proposal, to penalize violence in labor-management disputes, meets acceptance by big majorities, 98 percent of management and 66 percent of all workers.

Survey results clearly reveal that Philip Murray hadn't consulted CIO members when, in attacking the Case Bill, he condemned it as part of an anti-labor crusade and labeled the 60-day cooling-off period as an "insult" to labor. William Green, too, was talking through something resembling a hat when he told the Hatters, "the 7,500,000 members of the AFL will be rebels as long as that bill (the Case Bill) is on the statute books of the nation." Green went on to call it "notorious" and "vicious"—with which opinion his members don't agree.

An opportunity for management is once more highlighted by the survey. Workers are conservative thinkers (as was shown in *"What The Worker Really Thinks,"* FACTORY, December, 1945, and January, 1946). Worker opinion, as revealed in this survey, is frequently closer to management's viewpoint than it is to union leaders' thinking. Survey findings reveal once again the chance open to management to reach workers with a widespread public relations program to show them how close their interests are to management's.

How effective CIO and AFL publicity has been among industrial workers is shown in the contrast between opinions of union and non-union workers. Variations run from 1 percent on fact-finding boards to 23 percent on the draft issue, with non-union workers consistently more conservative. Union worker-education programs clearly show their influence on the rank and file.

Union publicity results show positively, too, in another way. Union members *seem* better informed, certainly are more willing to express their opinions. The number of workers who indicated "no opinion" on each question is consistently lower for union members except on one point, the injunction question, which concerns union leaders.

Although union influence is clearly shown and it will certainly be a political factor in some communities, if not on a national scale, it still is not great enough to wipe out the workers' fundamental desire for legislation to help settle disputes before they reach the strike stage, for legislation making unions more responsible, and for curbs on union violence and racketeering.

That, of course, ties into management thinking.

And, despite Administration fears, it's not far from what the people of the United States want.

CASTINGS WEIGH FROM 650 TO 900 POUNDS. TWO MEN RUN SEVEN MACHINES ON BUDA'S CYLINDER BLOCK LINE

EFFORTLESS HANDLING HALVES MACHINING COSTS

PAUL H. CURTISS, SR. • GENERAL SUPERINTENDENT, THE BUDA COMPANY, HARVEY, ILL.

Speed was the goal at Buda during the war. Low unit cost is the aim today. The same mechanical handling methods that once made the one possible now go far to insure the other.

Case in point is the diesel engine cylinder block production line, which is part of cylinder head and cylinder crankcase machine and assembly department. Its main feature is a roller conveyor. But the conveyor is supplemented by an unusual assortment of turntables, turnovers, slide carriages, and air lifts. All combine to minimize operator effort, reduce product cost, and contribute to quality workmanship.

Skilled planning provided for many switches and turns in adapting Buda's production lines to the limitations of a former foundry building. Rough castings, which weigh from 650 to 900 pounds, are initially loaded onto the roller conveyor by hoist and progress on the conveyor directly into fabricating machines, except where machine design or the nature of the processing calls for special loading or machine operations on reverse sides of the casting.

Net result is complete flexibility of operation. Production ups and downs have little effect on unit cost, which is about half what it would be if the line were set up in hoist-and-dolly fashion.

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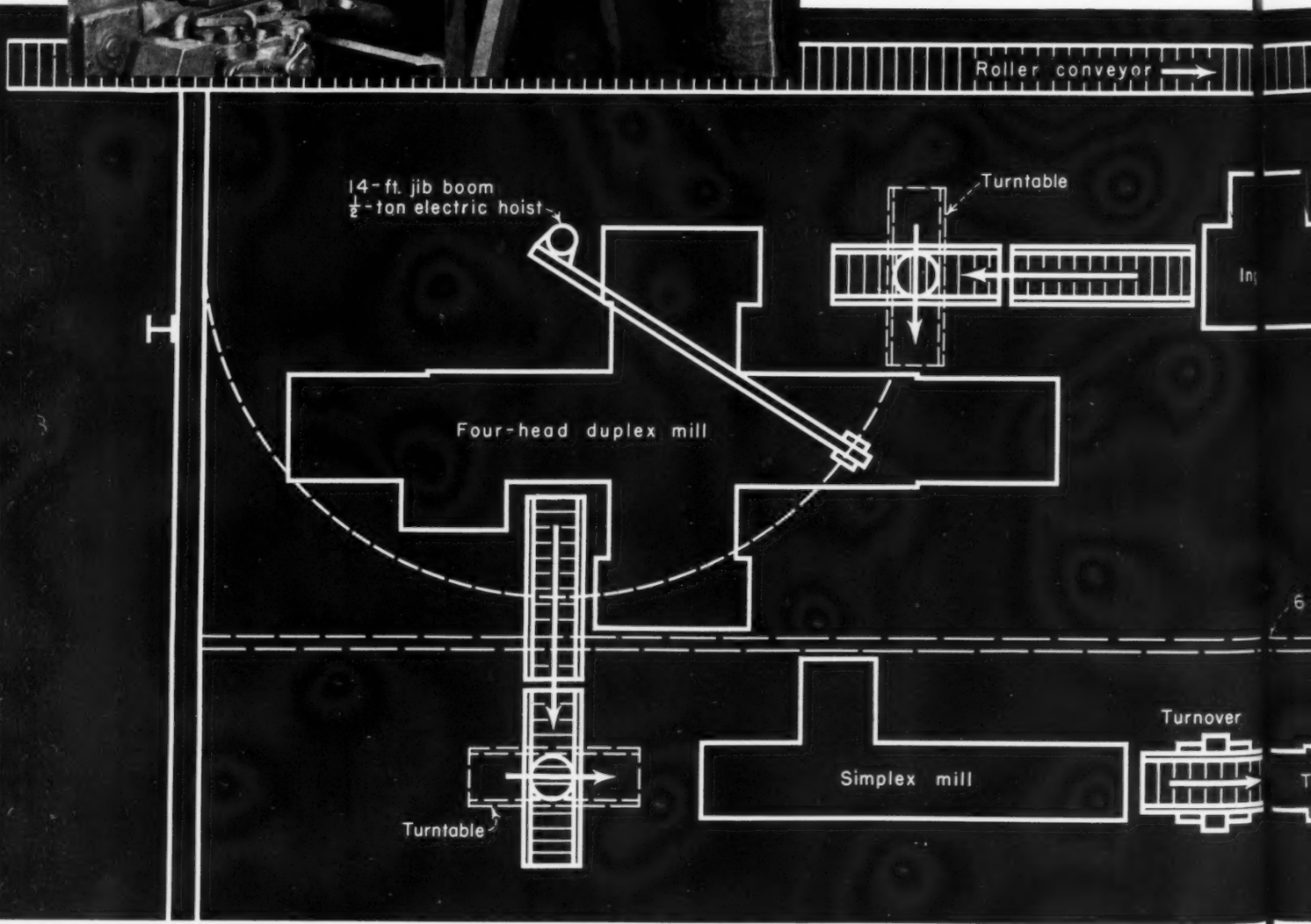
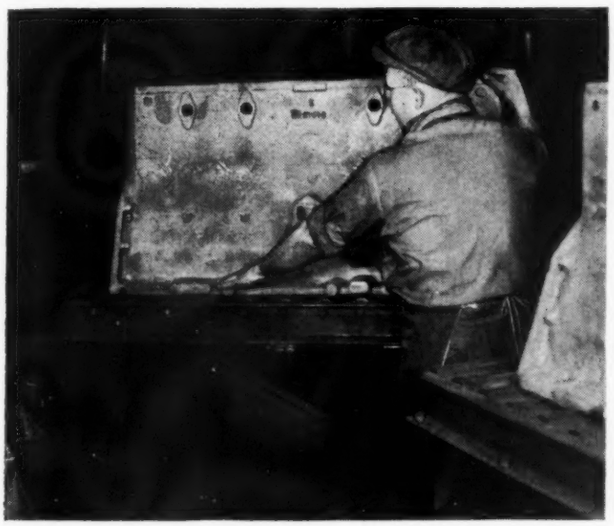
Operator turns hand wheel and reverses position of 900-lb. casting. Rollers on upper and lower surfaces aid in moving blocks in and out of turnover, which is counterbalanced to ease manual effort in turning. Performance of operations required on reverse side of the block is expedited. Eliminated is the slow and dangerous operation of using a hoist to pick up casting and rest it on floor while hook is changed to turn block over

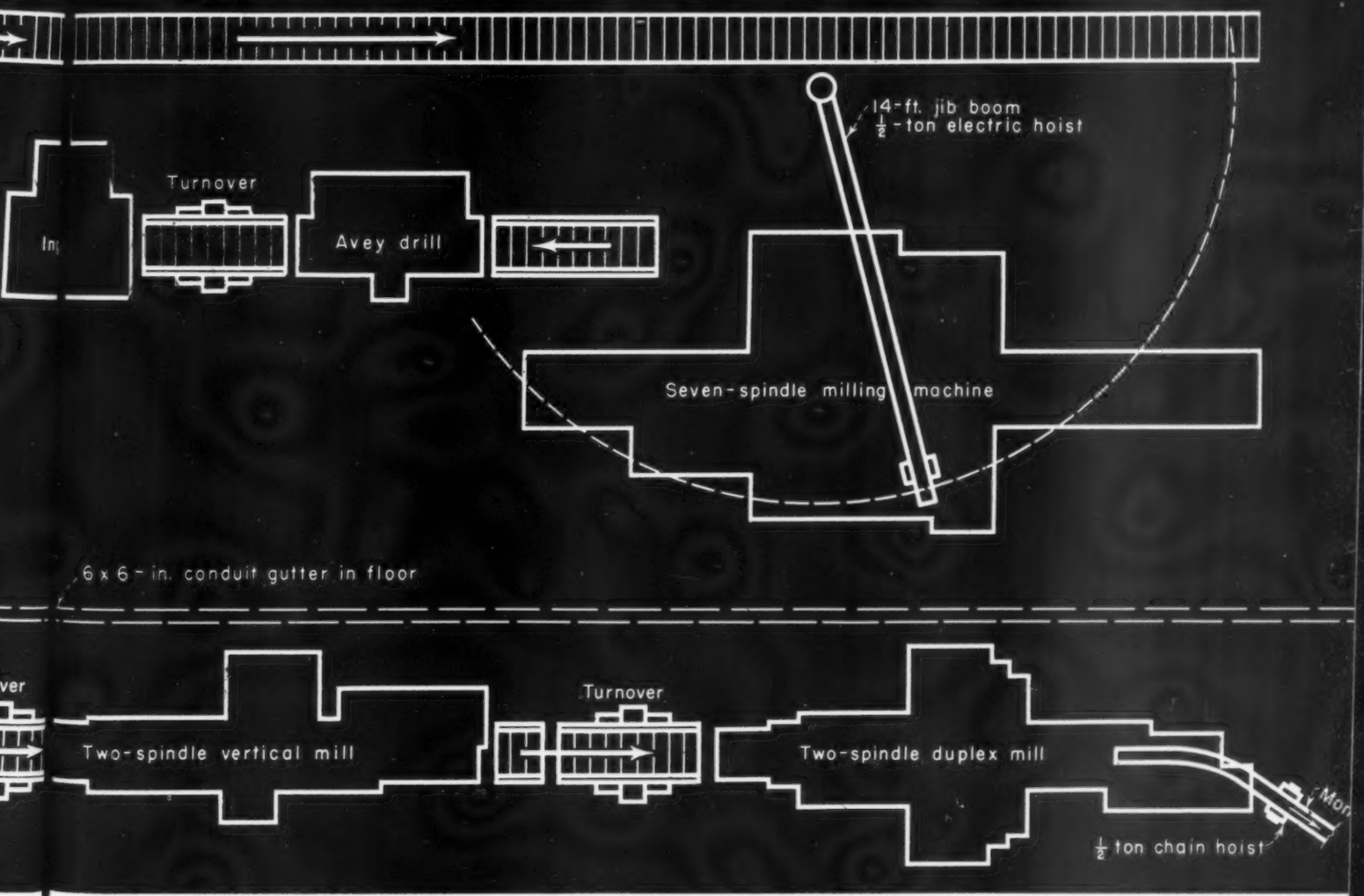




Turntable pivoted in the floor permits angle turns. Operator, by depressing foot lever, swings turntable and moves cylinder block directly into loading position. Curves and right angles save space and many feet of conveyor at Buda

From the main conveyor, cylinder block is pushed onto slide carriage. The large rollers are lowered by pushing the lever and block settles into position on smaller rollers. Carriage is then moved into position for loading cylinder block into the machine

LAYOUT FEATURES CONSTANT LEVEL OF OPERATIONS. HOISTS COME INTO PLAY ONLY WHERE TOP-LOADING INTO MACHINE IS REQUIRED



SCALE-MODEL PREVIEW OF PLANT AND PROCESS

KENNETH G. FREEMAN • PLANT LAYOUT ENGINEER, ONEIDA LTD., ONEIDA, N. Y.

Three-dimensional layout is speeding construction of Oneida Ltd.'s new factories and factory offices at Sherrill, N. Y. The scale model was assembled hurriedly for the express purpose of giving management an over-all picture of proposed arrangements.

The model was placed on special display for two weeks in the present factory's cafeteria and one of the builders was on duty during the noon hour to explain its details to all employees. A suggestion box was set up and many valuable suggestions for improvements were received from the workers.

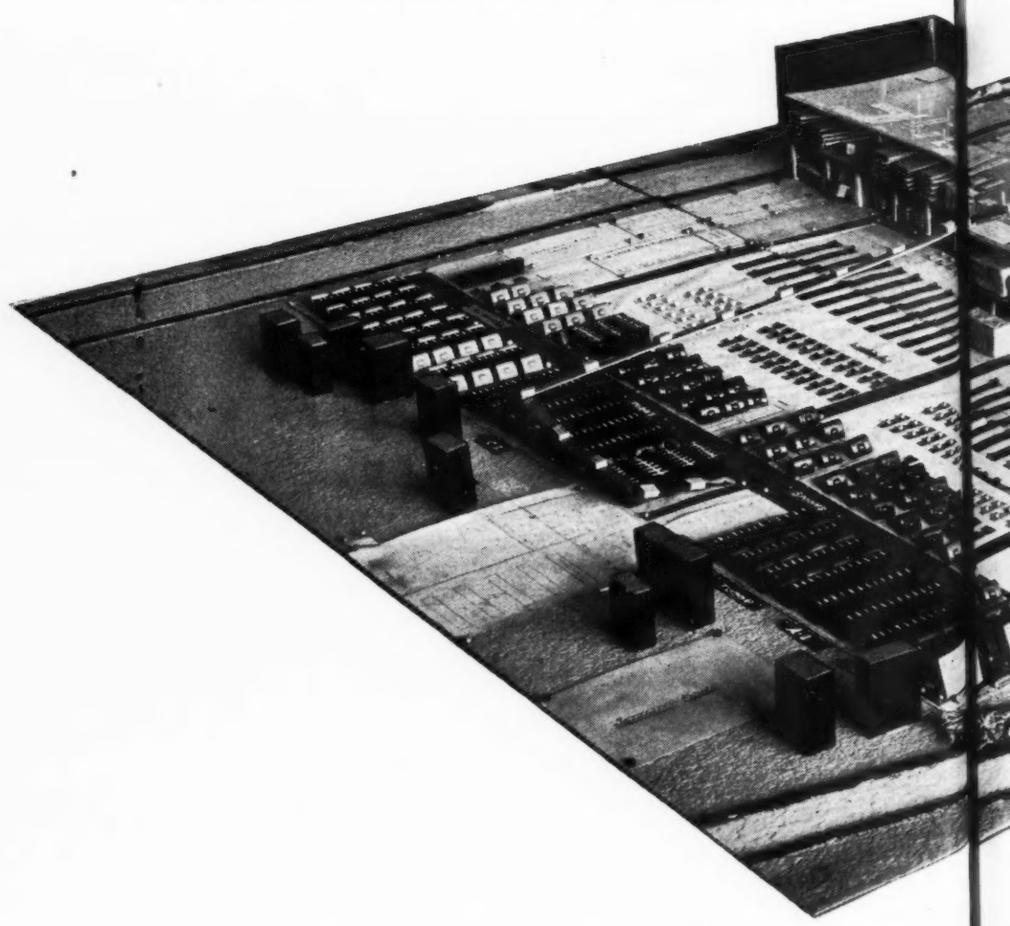
Limited space for displaying the finished layout made it necessary for engineers to adopt the non-standard ⅛-in. scale. Because of the intricacy of models made to this smaller scale, engineers confined the use of three-dimensional machine and building models to areas where conversion planning was most urgent and complicated. Detailed models will eventually be substituted in areas where paper cutouts served a temporary purpose in assembling the complete layout in the shortest time.

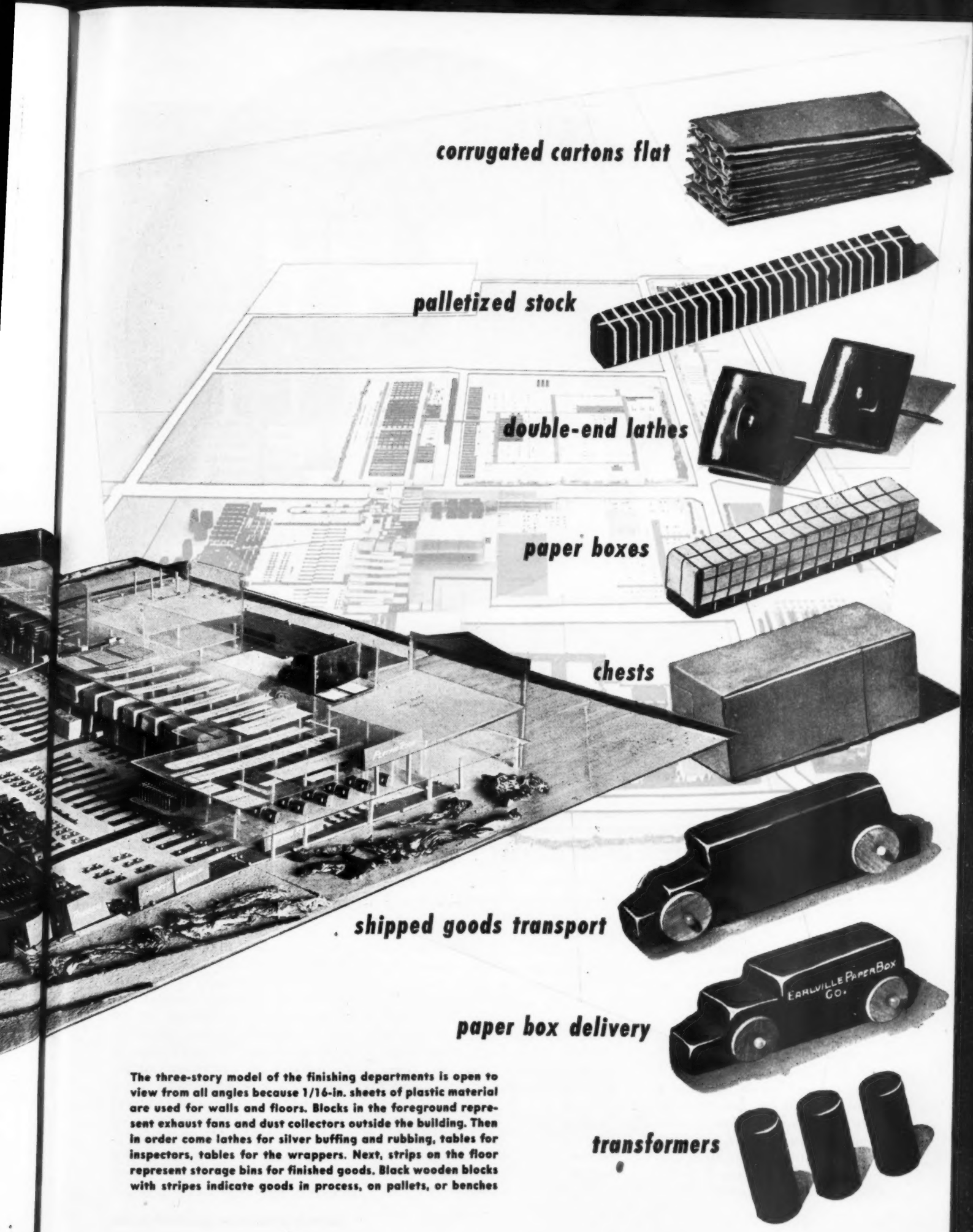
CAST OWN MODELS

Oneida cast machine models in its own plant from a special zinc die-casting alloy. Sharpened nails were inserted in the bottoms of the molds for fastening models to the ½-in. base boards. Models can thus be taken from the layout to executive meetings outside the department without disturbing the machine arrangement.

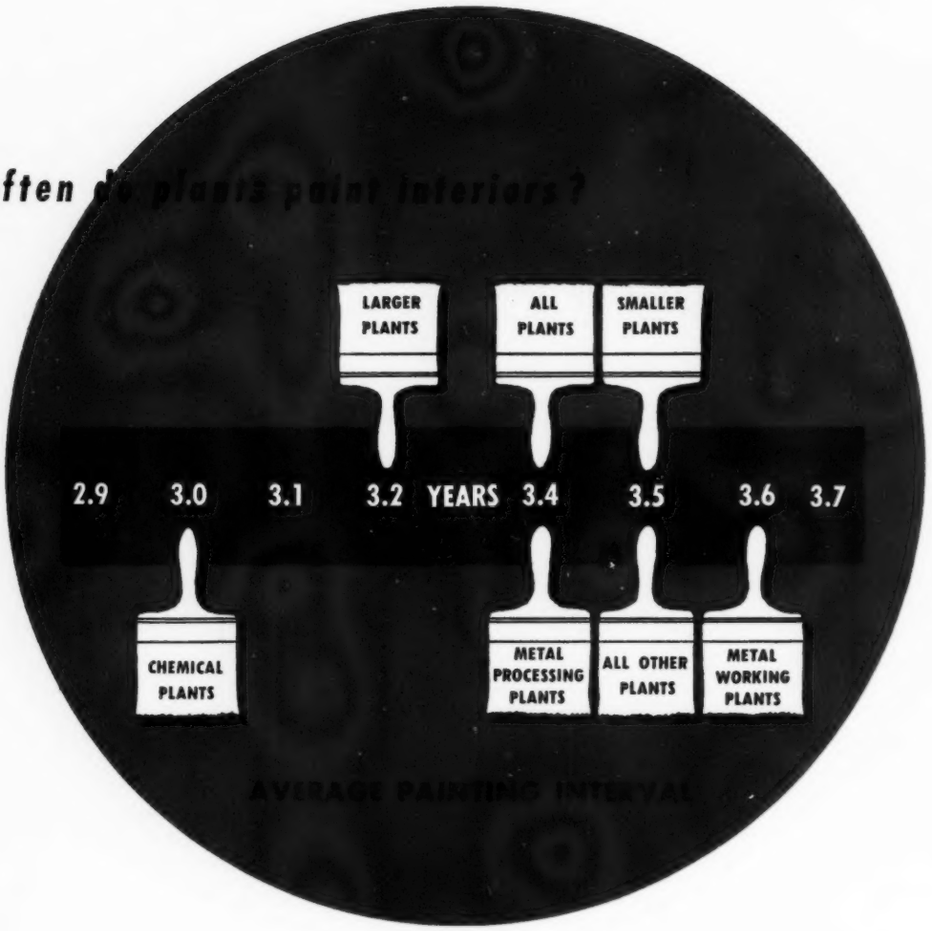
Machines are enameled in colors that differentiate groups processing various qualities and items of the product. Code letters on machines identify the specific operation performed by the unit. A flat color indicates initial operations in buffing areas. Gloss enamel finish of the same color represents the final polishing stations.

Model of the complete plant (right) measures 10x16 feet. Shrubbery and grass landscaping were made by dipping facial tissues in green ink and pressing soaked tissues into form. Roadways are painted light gray enamel and are curbed with thin strips of wood. Parking areas are tan. The softball field is green and contrasts with the blue background of the rest of the plot





The three-story model of the finishing departments is open to view from all angles because 1/16-in. sheets of plastic material are used for walls and floors. Blocks in the foreground represent exhaust fans and dust collectors outside the building. Then in order come lathes for silver buffing and rubbing, tables for inspectors, tables for the wrappers. Next, strips on the floor represent storage bins for finished goods. Black wooden blocks with stripes indicate goods in process, on pallets, or benches



MAINTENANCE PAINTING—A SURVEY OF PRACTICES IN 200 PLANTS

Two hundred companies of various sizes in the broad manufacturing industries. Ninety-eight of them engaged in the making of finished metal products; 27 in chemical or continuous-flow process industries; 23 in metal processing, providing rough stock for other manufacturers; 11 making food products; 10 in the woodworking and lumber milling trades; 7 in the textile industry. These, and 24 more that did not indicate an industrial classification, were the plants that answered FACTORY's questions about maintenance painting.

Replies came from all sections of the country. Slightly less than 20 percent of the plants were located in areas with year-round warm weather, where winter heat is little or no problem. However, this was found to have little or no effect on the average painting interval for interiors, which was very nearly 3.4 years both for these warm-weather plants and for all plants. For exteriors, the comparable figures were 3.1 and 3.6 years—more frequent painting in the warmer areas.

The respondents showed a wide variation as to size, ranging from as few as 20 to as many as 45,000 employees. Over-all, 59.9 percent of the plants had fewer than 1000 employees, and 40.1 percent had 1000 or more. An appreciable difference was noted in the painting interval of these two classes of plants, with the larger averaging 3.2 years, and the smaller 3.5 years.

Among types of industry, the spread of average painting intervals was pronounced, though not remarkable, ranging from 3.0 years for chemical plants to 3.4 years for the metal processing industry and 3.6 years for plants engaged in metal working. There was no significant bunching of answers from other industries; taken on the whole all other plants averaged 3.5 years.

If any one conclusion is fair on the basis of the results of this survey, it is only that *there is too little uniformity of painting practice today to be able to establish any set of rules of what constitutes good painting practice.* Apparently maintenance painting remains a problem that must be solved solely on the basis of the requirements of the individual plant. FACTORY's survey can merely provide signposts indicating *general* industrial practice, signposts that may be examined with a view to raising the question of whether or not an individual plant is using the painting plan best suited to it.

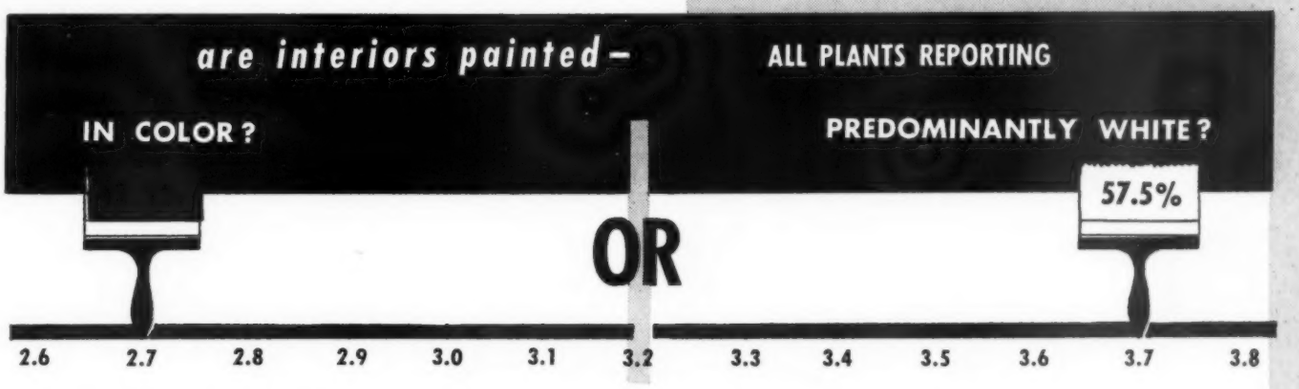
painting interval in years by size of plants and industries

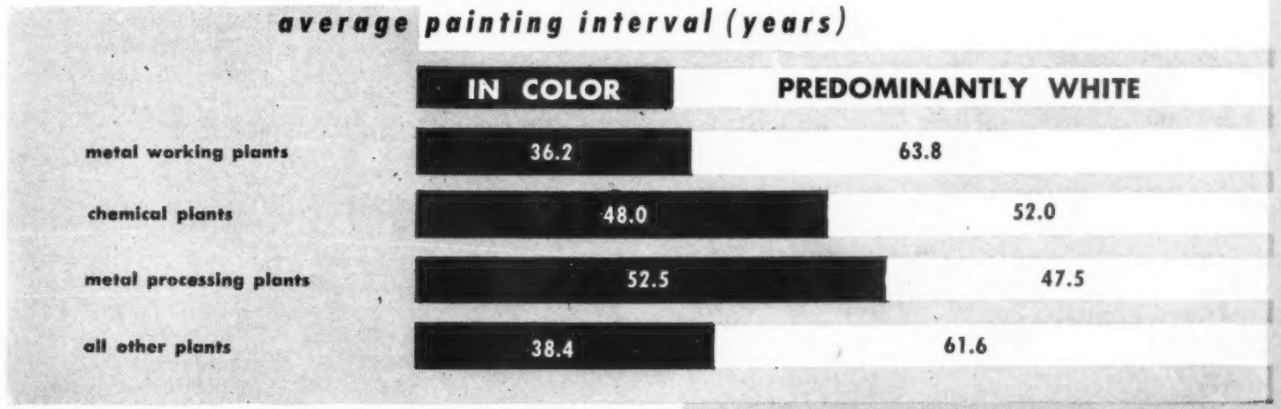
	EVERY YEAR	EVERY 2 YEARS	EVERY 3 YEARS	EVERY 4 YEARS	EVERY 5 YEARS	MORE THAN 5 YEARS
ALL PLANTS	7.1	19.2	30.1	14.1	19.2	10.2
LESS THAN 1000 EMPLOYEES[1]	6.5	16.1	31.1	16.1	20.4	9.6
MORE THAN 1000 EMPLOYEES[2]	7.9	23.9	28.6	11.1	17.5	11.1
METAL WORKING (86 PLANTS)	6.9	16.2	31.3	12.7	20.8	11.6
CHEMICAL (23 PLANTS)	8.7	21.8	39.2	21.8	8.7	
METAL PROCESSING (19 PLANTS)		26.3	36.8	15.8	10.5	10.5
OTHER INDUSTRIES (29 PLANTS)	10.3	13.8	20.7	10.3	24.1	13.8

[1] 59.9 PERCENT OF ALL PLANTS REPORTING

[2] 40.1 OF ALL PLANTS REPORTING

The Variation of Painting Practices by Industries Is Slight—





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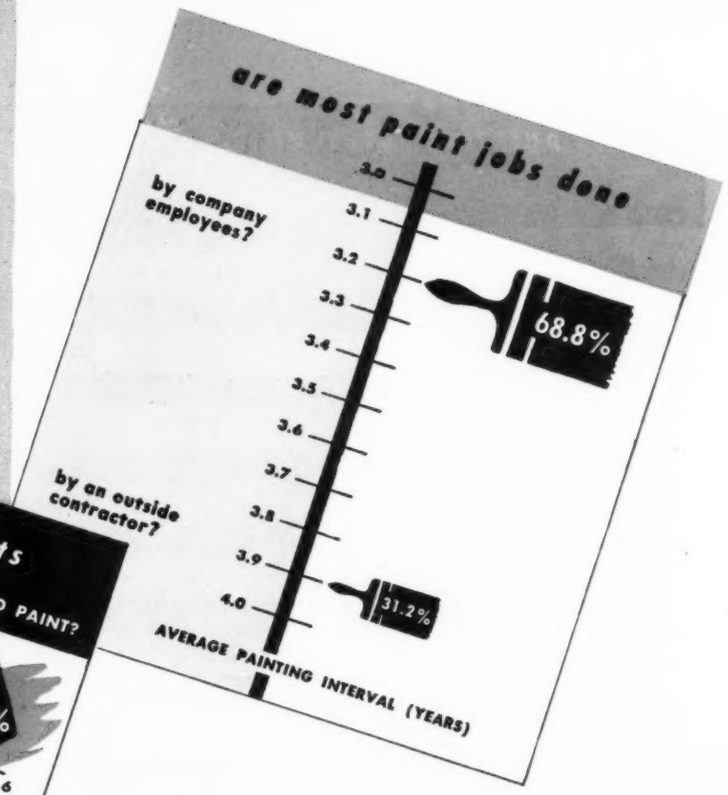
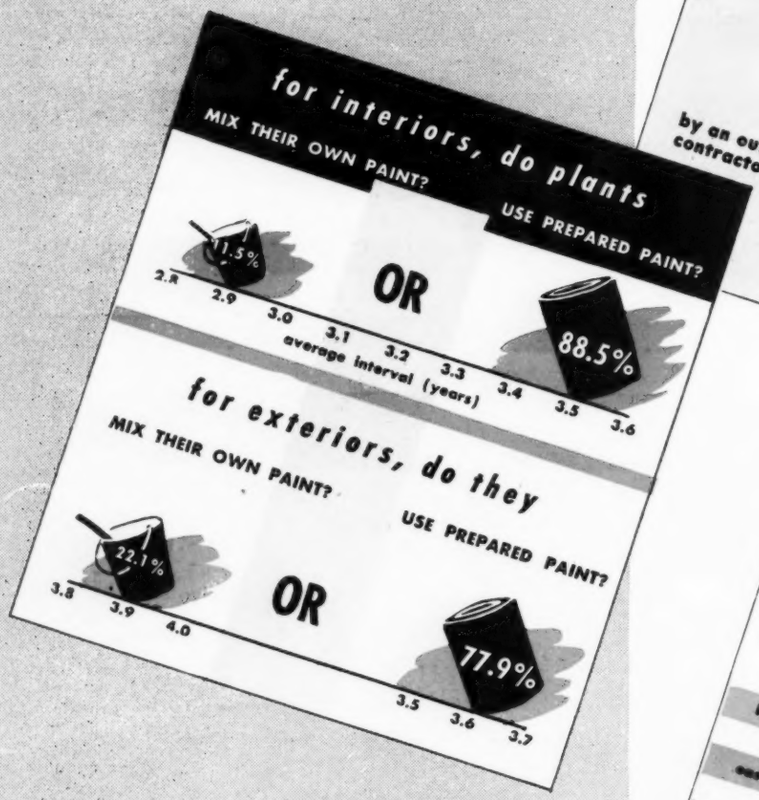
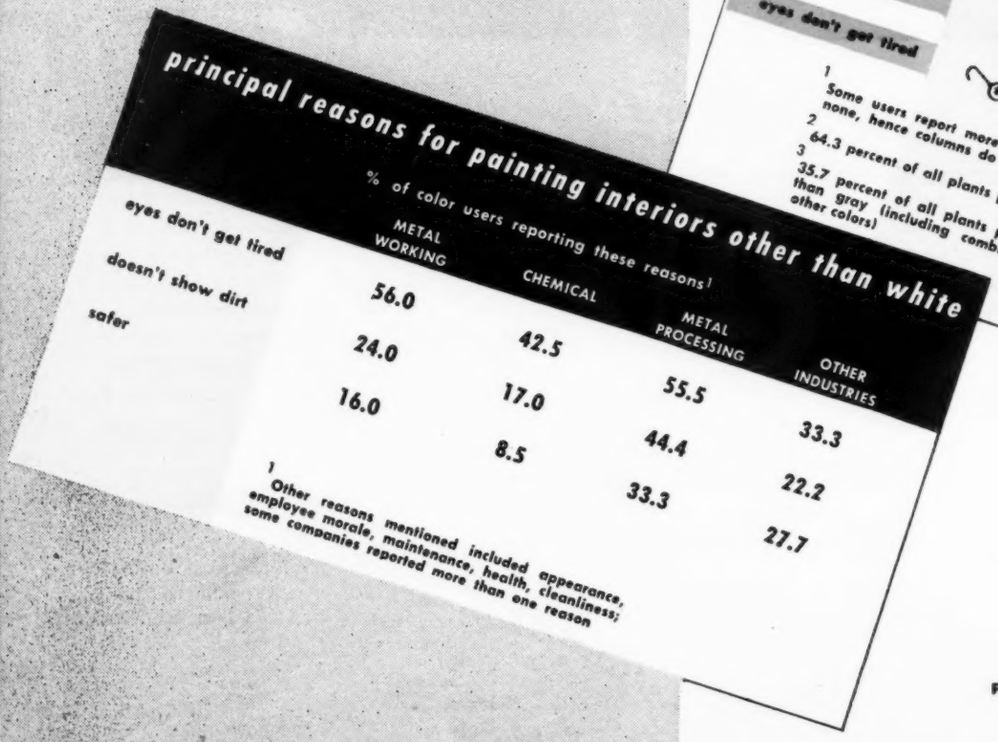
MAINTENANCE PAINTING SURVEY (continued)

No industry has a monopoly on the use of color, but reasons for its use vary. The metal processing industry leads the way in the use of color to promote safety; chemical plants are far behind in this respect







USING CASE MATERIAL TO PROMPT BETTER METHODS

Before-and-after photographs put the punch in a methods improvement program now in successful use at Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Mich.

To stimulate the search for better ways by the supervisory force, the company has photographs made of the more outstanding job improvements. Photographs are reduced to 2¾x4 inches for orderly presentation in a book titled "Better Methods." Each presentation of an improved operation includes photographs of both the old and new methods, description of the work to be performed, observed conditions of the methods involved, advantages of the new method, and the percentage of improvement gained.

Many improvements result from the intensive methods training program that Saginaw is giving to product designers and engineers, process engineers, time study engineers, and others of a supervisory capacity. Employees who are below the supervisory level contribute to the program through a suggestion system.

The better methods book is periodically passed around to all supervisors to acquaint them with improvements being made and help suggest ideas for additional improvements.

OLD METHOD

OPERATION. Sort forms into alphabetical order

DESCRIPTION. Various piles of printed material lying flat on desk top are sorted into alphabetical order. Long reaching movements, time lost in locating correct piles, and standing position were usually the observed conditions

IMPROVED METHOD

DESCRIPTION. Forms are placed in convenient, clearly marked sections. Movements are confined to the normal work area

OLD METHOD

OPERATION. Gather printed matter, such as engineering reports, specifications, or other forms into proper order

DESCRIPTION. Pick up one copy from each of a number of piles lying flat on desk top, assemble and straighten in proper order and staple. Long reaching movements, improper height for standing position, difficulty in straightening assembled sheets were conditions observed

IMPROVED METHOD

DESCRIPTION. Place printed sheets (one with each hand) in the inclined slots, complete operation for all sheets, straighten and staple them on machine in front of the sorter and place them on flat part of table to right or left of operator

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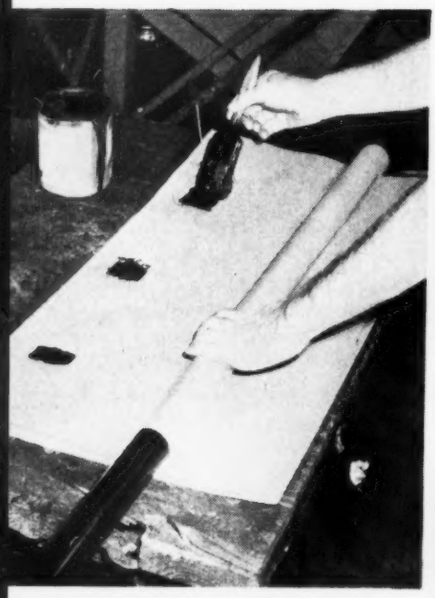
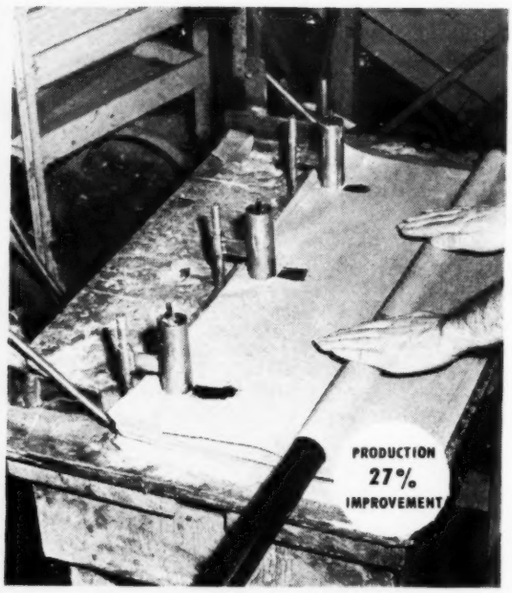
old



new



OLD METHOD

OPERATION. Wrap jackets with paper

DESCRIPTION. Operator rolls jacket into paper a few turns, picks up brush and applies paste in three spots, and completes the wrapping

NEW METHOD

DESCRIPTION. Operator rolls jacket into paper a few turns, pulls the paper from under paste dispensers, and completes the wrapping operation. It is not necessary to handle brush

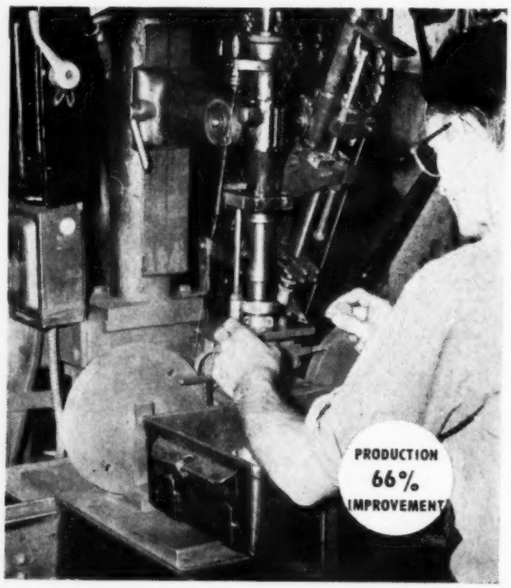
OLD METHOD

OPERATION. Milling for stock to length

DESCRIPTION. Operator removes and places bar stock into machine by hand. Full time is spent in tending one machine

IMPROVED METHOD

DESCRIPTION. Installation of loading hopper on back of machine and pick-up fingers to unload at the front of the machine enables operator to run more than one machine. Constant attention for one machine is not required. This results in a substantial reduction in cost even though production from the machine is not changed



OLD METHOD

OPERATION. Polish bottom of bearing

DESCRIPTION. Operator had to stop the spindle approximately every 20 pieces, tear off a strip from a roll of emery cloth and place it over and into slotted end of spindle in order to polish bottom of the bearing. Operation was not satisfactory as to quality and effort required

IMPROVED METHOD

DESCRIPTION. Operation is now practically automatic. Part is placed on pilot and a foot valve is tripped. Spindle moves to the work and revolves the part on the emery cloth over the top of the pilot for a controlled period and returns to up position. In returning to up position, reel of emery cloth moves forward slightly, insuring a new surface of cloth for each piece and full use of the entire length of the roll. Effort is reduced and quality is greatly improved

old

new

OLD METHOD

OPERATION. Solder wire to horn contact assembly

DESCRIPTION. Two operators were employed on this job. One loaded the contact assemblies into fixtures on the turntable and removed finished assemblies. The other operator soldered the wire to contact assembly. Soldering iron had to be held constantly in the position shown. There was an unbalanced condition in the distribution of work for the two operators

IMPROVED METHOD

DESCRIPTION. A foot-operated fixture to support soldering iron was installed. Contact assembly is placed in the nest with the left hand and wire is positioned with the right hand. Wires are received with a gob of solder adhering. Part is soldered, and as the iron returns to the up position an air valve is actuated, cooling the solder so that the right hand can remove the assembly immediately

OLD METHOD

OPERATION. Inspect bearing assembly

DESCRIPTION. Pick up bearing assembly and check with hand pick to see if needle rollers are free to rotate without binding

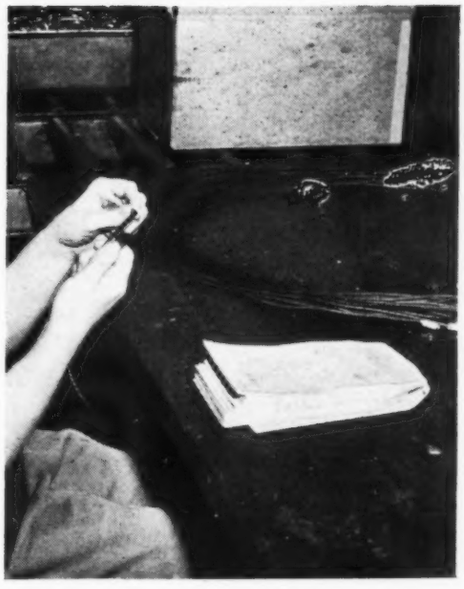
IMPROVED METHOD

DESCRIPTION. Pick up bearing assembly with each hand, place on revolving pilots and check needle rollers, then place in tray below pilots. A spring actuated plunger engages the needle rollers. If binding occurs the part will turn in the operator's hand. Both hands can thus perform useful work

OLD METHOD

OPERATION. Unitize horn wire assembly

DESCRIPTION. Roll up horn wire assembly, open paper bag by hand and insert wire assembly, fold latex coated flap of bag and place in carton



IMPROVED METHOD

DESCRIPTION. Roll up horn wire assembly on mechanical device with left hand. While this is being done, the right hand inserts the previously rolled wire assembly into the bag, opened by air blast operated by foot air valve, and closes flap of bag and places it in a carton

WE KEEP EXHAUST SYSTEMS CLEAN TO KEEP THEM RUNNING

C. G. RILEY • SUPERINTENDENT OF MAINTENANCE, AMERICAN SAFETY RAZOR COMPANY, BROOKLYN, N. Y.

Keeping exhaust systems clean is the most important factor in maintaining them in efficient operating condition. To be sure, other kinds of maintenance attention are required, but the cleaning operations called for by the 35 systems in the American Safety Razor Company plant account for the bulk of the work spent on them.

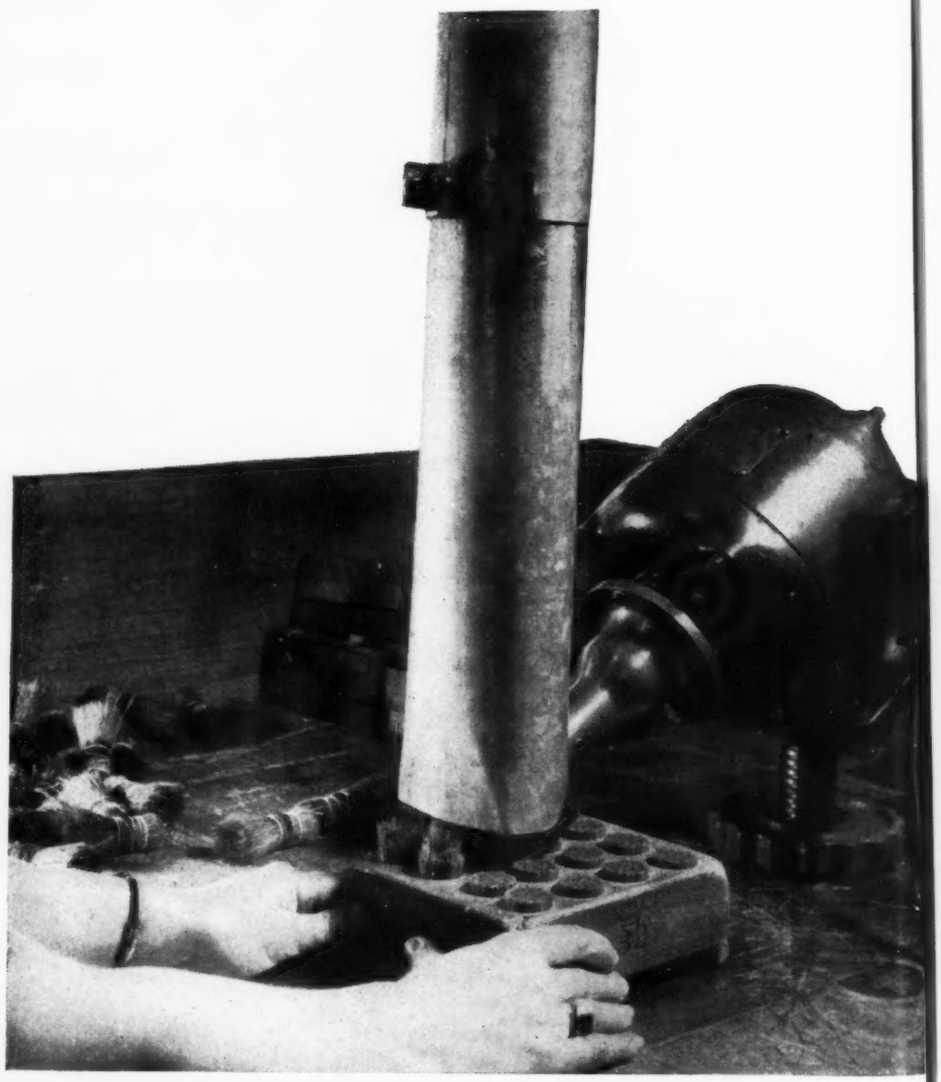
Naturally, the amount of cleaning needed to keep a system in good condition depends on the service performed. Here there are about 17 different applications in which the exhaust systems handle air containing such diverse substances as bristles, acid fumes, dust and lint from buffing operations, offensive odors, lacquer fumes, and the fumes and hot air from heat-treating furnaces.

There is an equally wide difference in the size and complexity of the systems. They range from a small installation having approximately 30 feet of duct, serving two operations, and employing a 3-hp. motor, to an extensive system with numerous intakes and more than 200 feet of duct, driven by a 40-hp. motor.

These systems were carefully engineered and properly installed. Much attention was paid to ease of accessibility for cleaning and maintenance. Clean-out doors are numerous, closely spaced, and as easy to get at as they could be made. All the systems have been designed for a capacity at least 15 percent more than the theoretical or estimated value. Joints in all ducts and hoods are soldered to prevent leakage of air with resultant loss of capacity.

Particular care has been taken to eliminate all projections on the inside of ducts. Even small projections can catch lint or other materials in the exhausted air, with the result that the ducts may quickly be plugged.

Supports are strong and rigid.



Short bristles from the brush-clipping operation are removed by a small exhaust system that serves two tables. Thorough cleaning once a day is necessary to keep system from clogging

Such details are important in keeping maintenance costs low and making it easy to supervise cleaning and other operations.

CLEANED EVERY DAY

All exhaust systems that handle air containing bristles or the lint and dust from buffing operations are cleaned out daily, immediately after the end of the day's shift. If bristles once start to pile up in a duct it will be plugged in a short time. For this reason the bristle-handling systems are run for at least 15 minutes after the end of the shift, to make sure that the system is clean.

The lint from buffing wheels is mixed with the polishing compound and is

highly flammable. Ducts, hoods, and cyclones of exhaust systems for buffing operations are thoroughly cleaned of lint, which is promptly taken to the boiler room and burned.

Ducts and cyclones of systems handling air that is comparatively free from solid particles are cleaned regularly at intervals which experience has shown to be adequate.

All motors driving exhaust fans are inspected, and oiled if necessary, once a day. The larger fans are driven through flat or V-belts which are also checked daily.

CORROSION PROTECTION

Hoods and ducts of systems handling acid fumes from finishing and plating operations have to be watched carefully for corrosion. Before installation these parts are given three coats of an acid-resistant asphaltic-base paint, on the inside. The outside is finished with the same paint, over which is applied a coat of light gray acid-resistant enamel. When signs of corrosion appear, usually at intervals from four to six months, the surfaces are carefully cleaned and repainted.

Similar attention is given to the system handling air that contains steam or excessive amounts of moisture. With these systems, however, the corrosive conditions are less severe; hence the intervals between painting are somewhat longer.

One small system exhausts the fumes from a lacquer dipping operation. The hood is cleaned daily, but lacquer slowly builds up on the inside of the duct. No practicable way has been found to remove this deposit, which is smooth and shiny. Hence, when it reaches appreciable thickness the duct is taken down and replaced, to eliminate a possible fire hazard.

Twice a month all the exhaust systems are examined carefully from hood to cyclone. Particular attention is paid to supports and the condition of ducts and joints. Any defective conditions discovered in any part of the system are promptly remedied.

Once or twice a year, oftener if there have been changes in the operating conditions, the suction of all systems is accurately measured.

Fans are thoroughly inspected, cleaned and painted once a year.

All cyclones and ducts, both outdoors and inside, are cleaned and painted about every two years.

Exhaust system is driven by a 5-hp. motor, pulls 8000 cubic feet of air per minute, removes lint and dust from buffing operations. Each table in the production line has two buffing wheels and hoods. System is thoroughly cleaned at end of day shift

The cyclone for this exhaust system, which serves a bristle-mixing machine, is mounted indoors to facilitate cleaning and inspection. Located at the machines are five hoods through which 4500 cubic feet of air per minute are drawn

Not many leaders of industry have as many interests—or as widely diversified interests—as Paul Gary Hoffman. He is nationally known, of course, as chairman and frequent spokesman for the Committee for Economic Devolepment, and as president of the Studebaker Corporation, South Bend, Ind.

But he is also: Chairman of the board, Paul G. Hoffman Company and Hoffman Specialty Company. Director, Federal Reserve Bank of Chicago, Chicago Corporation, New York Life Insurance Company, United Airlines, and Encyclopaedia Britannica. Chairman, Automotive Safety Foundation. Honorary chairman, United China Relief, Inc. Member, Business Advisory Council (Department of Commerce), and Visiting Committee, Department of Government, Harvard University. Trustee, Tax Foundation, Institute of Pacific Relations, Inc., University of Chicago, Kenyon College.

Hoffman holds three honorary degrees—from Rose Polytechnic Institute, University of Southern California, and University of Rochester. Two books carrying his name as author on the title page testify to his knowledge of the automobile business, which he learned the hard way. He started—as a porter for the Chicago distributor of the almost-forgotten Halladay car—when the business was still in the infant stage. Going over to Studebaker as a salesman in Los Angeles in 1911, Hoffman climbed steadily through the organization, except for two years spent as a lieutenant in the Army in World War I, to become president in 1935.

PRIVATE ENTERPRISE AT 39–1 IS GOOD ENOUGH FOR ME

PAUL G. HOFFMAN • CHAIRMAN, COMMITTEE FOR ECONOMIC DEVELOPMENT, AND PRESIDENT, STUDEBAKER CORPORATION

Today we are living and working in a society where significant changes are the order of the day. Few, if any, of us have enough perspective to judge how really vast these changes are or how rapidly they are taking place. But we can at least see the extremes which they produce in people's reaction to them.

On the one extreme we have stubborn and ignorant *opposition to change of any kind;* at the other, we hear demands for changes that would radically alter our way of life. In the midst of the resulting confusion it is some comfort to realize that it was ever thus, and yet we have been able to steer a course of progress between the apostles of revolution and those of reaction. We shall do well to ignore the extremists and seek to carry forward into the postwar world those fundamentals about our way of living and working together that have served us well in the past, with our chief goal being to make them serve us still better in the future.

First among these fundamentals I list the preservation of the *free society* which permits us as individual citizens to make the most of our lives in whatever way we see fit. *A free economy can exist only within the framework of a free society.* The expansion and maintenance of our free economy is a prime responsibility of all businessmen as the goods-producers and job-creators in the economy.

I say it is a *prime* responsibility of businessmen, but notice that I do not say it is *solely* their responsibility. To me it is a wearisome process to hear on the one hand those who say that, if the government would only get completely out of the business picture, private enterprise would solve all our economic problems, while others are urging government to expand its economic responsibilities of *guaranteeing* every need from jobs for all to an equal share of all goods and services.

In an economy as vast and complex

and dynamic as ours, it seems only reasonable to expect that there should be certain responsibilities that fall properly on *government;* others that fall on *business.*

GOVERNMENT'S ROLE

It is well to recall that "the government" in our democratic society is, after all, "ourselves," and as such is expected to act in the enlightened self-interest of "ourselves." Too many of us are inclined to look on government as something apart from us on which we can push responsibilities that we prefer not to carry ourselves.

Because of this attitude we find many who currently believe that the government could and should guarantee "jobs for all." That is quite an assignment for a government that has never provided more than 5 percent of total national employment, and which is, by the very nature of our democratic system, a government of limited powers. To assume such a drastic responsibility, the government would of necessity have to assume all manner of social and economic powers to itself.

On the other hand, to say that it is not a function of government to provide jobs directly is not equivalent to saying that government has no responsibilities for maintaining employment. There are many opportunities and responsibilities for wise and constructive action by government that are essential to the process of job creation in a free private economy.

Chief among these are those functions aimed at bringing more *stability* to production and employment. Since 1900 we have had one major depression, two minor depressions, at least three "recessions." And now we find ourselves after four years of war boom with our economy virtually doubled in terms of dynamic power which is pregnant with the potentialities of either the greatest boom or the worst depression in history. Under these circumstances I believe the desired objective is to avoid both extremes; to stabilize instead at a high level of productive employment and then go on from there to realize the full rewards of a free society based on a free economy.

We, the people, acting through government, can contribute greatly to such an objective in several specific ways. We can make an excellent start by overhauling our fiscal and tax policies so as to make them help rather than hinder the creation of jobs and the expansion of productivity.

Just as some of us as individuals are prone to shirk our responsibilities as citizens by shifting more and more of them to government, just so elected representatives in government have sought to shift tax responsibilities from individuals to inanimate things like "business." This has led to the most damaging fallacy in our present tax system, which is that corporations, commodities, or transactions (business) can pay taxes. Business can collect taxes, but only people—real live persons who create wealth directly by farming, or making goods, or who draw salaries or other income—only they can pay taxes.

Government properly could meet another part of its economic responsibility by planning for, in contrast to planning against, competition. Too often, and frequently under encouragement from business and labor, government has directed its planning against competition by such means as price maintenance schemes, freezing of trade practices, and the like.

I happen to be one who still believes that tough competition is a good thing, and I am therefore in favor of such government regulation of monopolistic competition and such other government policing as will strengthen rather than weaken the areas in which competition exists.

Allied to this is another proper government function in our economy, and one that currently has great importance. This is the encouraging and assisting of new and small enterprises which are the seed bed of our economic growth. As a result of the war there is on the one hand a vast unfilled need for goods and services that can be supplied by small and local enterprises; on the other hand there are several million ex-servicemen, war workers, and others who have husbanded their savings and improved their skills with a hope of "becoming their own boss" by establishing new small businesses. They want to become job-makers instead of job-seekers. Government at all levels —federal, state, and local—can do many practical things to help these new enterprisers get started.

In the first place, government can help by simply removing or modifying a long list of accumulated obstacles in the path of small businesses—obstacles ranging from taxes that bear heavily on businesses during their precarious starting years to old zoning laws and commercial ordinances which have remained on local statute books since horse-and-buggy days. But more than removing obstacles, government can provide positive help by providing production and merchandising information in simple, usable form.

And for all business, irrespective of size, government can take bold new steps in meeting its responsibilities for opening up and expanding our foreign trade. One of the greatest questions facing the world today, not only economically but also politically, is whether we are to have a restoration of private trading between the countries of the world, or whether trading is to become a state function.

Finally, I list two broad functions which have, after much controversy, become generally recognized as proper responsibilities of government in the stabilizing of our dynamic economy. One of these is the replacing of personal economic insecurity of workers through unemployment compensation coverage; the other is the proper planning and carrying out of public works. By stabilizing purchasing power and, more importantly, by maintaining the confidence of individuals in their future security, both can serve as effective balance wheels in a free enterprise system.

WHAT BUSINESS CAN DO

I have discussed the responsibilties of government in our post-war economic picture first because they contribute largely to the economic climate in which we operate. But at best government can exert only a "permissive" influence if it is to remain a government of limited powers. It seems to me self-evident that the chief responsibility falls on private business enterprise to seize the opportunity thus offered to expand and strengthen productivity and employment within our free enterprise system.

In spite of our faltering in recent years and shifting of too many of our private responsibilities to government, 90 percent of our enterprise is still carried on by private individuals and concerns. Moreover, this private economy of ours, operated by and for 6 percent of the world's population, produces 25 percent of the world's goods.

In view of such facts I find it difficult to understand those persons who seek either a substitute for our free enterprise system itself or else a substitute

MANAGEMENT'S JOB AS PAUL HOFFMAN SEES IT—

Expansion and maintenance of our free society—and of free economy within that society—is the prime responsibility of all businessmen.

Business managers can make their contribution by:

1. Promoting and developing the growth of individuals in their organizations . . . the strength of the country is no more than the composite strength of the individuals who make it up.

2. Operating profitably . . . that is the surest criterion that management is contributing to the growth of our economy as a whole.

3. Adding stability to the economy . . . by having plans ready, at all times, for expansion. By regularizing employment. By keeping up continuing sales and advertising pressures. By carrying on constant research.

To face new doubting and mouthing . . . I know of no better answer than the answer we gave to the challenge of war—*hard work and hard thinking*. They pay off in more and better jobs, in more and better goods and services, and, above all, in more individual freedom to enjoy the fruits of our labor.

for the profit motive which makes it work. I see much more reward in seeking ways to make both operate more effectively. Accordingly, I believe that business managers can make their greatest contribution to our economy by promoting the growth and development of the individuals within their own organizations. After all, the strength of a country or an economy is nothing more than a composite of the strength of the individuals who make it up.

In a very real sense, the managers of business are the trustees of the capabilities and potentialities of their employees, just as they are trustees of the funds of their investors. In this dual regard I see no need for quibbling over the justification of profits. I consider that operating profitably is the first duty of management for the simple and practical reasons that without profit there is no incentive to business growth and expansion; no reward to call forth the best efforts of employees; and therefore no reasonable expectation of the fullest utilization of our collective resources. I repeat, therefore, that to operate their business profitably is a responsibility which management has to its associates, its stockholders, its workers, and to the public generally. I say further that profitable operation under free competition is the surest criterion that management is contributing to the growth of our economy as a whole.

In order to add stability as well as growth to the economy, I believe that management has a further responsibility to have ready, at all times, intelligent, courageous plans for carrying on and expanding their business—and by plans I mean plans that are completed and maintained in readiness to be applied quickly.

As a continuing objective of such planning, management has the responsibility to regularize employment, not only to stabilize its own operations and thus add to the security and well-being of its workers, but to contribute by just that much to the stability of the national economy.

Much already has been done, but more can be done, to flatten out the seasonal curve in employment in most industries. For example, the automobile industry initiated a campaign in 1938 that resulted in a substantial improvement from the standpoint of steadiness of employment. Introduction of new models was shifted from the spring to the fall, and programs were developed for the building of parts and components in the normally dull winter months.

As a related responsibility, business managers have the responsibility of keeping up continuing sales and advertising pressures. In the past they have been too prone to curtail their sales and advertsing budgets at the first sign of a decline in demand. This is the time when they should increase, not decrease, their sales effort.

Finally, management has a responsibility to carry on constant research looking particularly to the development of new products and services that will enrich our living and fill needs that are unrecognized today. Radio is probably the most recent example of such a product. We can get some idea of the debt we owe to commercial research when we face the fact that products and services of which we did not even have a glimpse 100 years ago now provide employment for the great majority of our people.

In view of this progress, freshly dramatized by what the war has taught us about our capabilities, we shall do well to avoid a return to the slothful thinking of the thirties. Then it was that we talked of maturity and made more plans for dividing what we had than plans for producing more to divide.

Now, in the midst of domestic reconversions, and at the same time in the midst of a world where socialism is feeding on the weakened mental fibers of war-weary people, we face new doubting and mouthing about the limitations of our democratic free society and its underpinnings of a free economy. As a businessman and as a member of a management that has responsibilities to its stockholders, to its workers, and to the public, I know of no answer that is better than the answer we gave to the challenge of war—hard work and hard thinking, which pay off in more and better jobs, in more and better goods and services, and, above all, in more individual freedom to enjoy the fruits of our labor.

FREE SOCIETIES

I do not hold with those who urge that we give up part of our freedom in the false hope that it will get us more goods for less work. I for one need more proof than has been offered that any kind of "planned economy" can assure prosperity and security for all. Since the start of the Christian era, with its basic doctrine of the worth and dignity of the individual, there have lived and died upon this earth, according to the best available estimates, some 40 billion people. Of these, not over one billion have ever lived in nations with free societies and free economies. *Yet they have been the only people who have ever risen above mere subsistence.*

Odds of 39 to 1 in favor of a free democratic society are good enough for me.

Work in Detrola's small parts stockroom proceeds with the quietness and dispatch that produce a "musical tone from the cash register in the plant office"

BETTER STOCK HANDLING AT HALF THE OLD COST

GEORGE H. FUNK • MANAGER OF PLANNING AND MATERIAL CONTROL, DETROLA RADIO DIVISION, INTERNATIONAL DETROLA CORP., DETROIT

Simplification of stock handling procedures at Detrola Radio is paying off in time and money saved. A single-card record system has replaced a four-card system previously used. Clerical groups involved have been reduced in number 25 to 40 percent, depending on the group and volume of production. Two stockrooms replace a major stockroom, which was supplemented by department stockrooms in the production areas. Stockroom and stock handling workers have been reduced by 50 percent.

Keynote of the plan is to reduce actual handling of stock and reduce number of record forms involved.

In a broad sense, the general system of inventory is similar to the "automotive" system in which a known total of parts purchased and received is balanced against total of used parts, as represented by the number of finished products sent out the back door. A balance or inventory check is taken once a month, and at Detrola this amounts only to clearing and totaling the figures on the one record card. Error in stock record after one year's operation has leveled off at less than 1 percent.

All information is entered on the

DESCRIPTION Nut, 6-32 X ¼ Hex hd. Cad. Plate

Order No.	Model No.	Quantity	Usage	Total Usage	Order No.	Model No.	Quantity
	550					572	39,000
	554	37,000	1	37,000		576	11,000
	558					579	20,000
	562					582	10,000
	564					591	12,000
	568	80,000	4	320,000		610	5,000
	571					610A	
	571A					611	
	571B					611A	

RECEIPTS — P. O. NO. — QUAN.

Date	Rec'r. No.	P. O. No.	Quan. Rec'd	Cum. Quan.	Balance	Balance
12-3-45	119506	58022	50,000	50,000	300,000	
12-5-45	120 001	580022	100,000	150,000	200,000	
12-6-45	121 000	59000	200,000	350,000		

VENDOR	P. O. Date	P. O. No.	Quantity
National Screw + Mfg. Co	12-1-45	W-58022	350,00
Central Screw + Mfg. Co	12-15-45	W-59000	350,00
Federal Screw + Mfg. Co.	1-5-46	W-59500	300,00

One handling operation is eliminated by storing parts in original containers. In this bulk storeroom, large parts and parts held in quantities too great for totepans are stored on numbered floor sections

record form. Entries of shipments received are made as shipments arrive and are accepted through inspection to stock. Daily usage in production is not entered on the record card, because quantities used can always be obtained by multiplying the number of completed products by the number of parts per product. Clearance of balances received is totaled in the cumulative total column; subtraction gives the stock status. It is simple, and it works. Checking against a production schedule gives a quick, accurate forecast of stock that will be needed.

The two stockrooms are designated as bulk stock and small parts stock. Work proceeds with quietness and dispatch—a type of activity that produces a musical tone from the cash register in the front office.

If possible, original containers are used, eliminating one handling. For example, vacuum tubes, stored in a separate room within the bulk stockroom, are shelved in the manufacturer's carton, which is of uniform size with typical "egg-crate" dividers. The cartons are faced evenly and outward on the shelves with the tube number and Detrola part number both in plain view. When delivered to the production floor, the tubes are put in standard totepans.

As a further improvement, details are being worked out to eliminate the totepans and deliver a full carton of tubes to production, where dividers will be pulled out and the tubes fed directly through a chute to the worker.

In both stockrooms standard totepans in two sizes are used when it is not practical to use original containers. On the front of each pan are hooks to hold a part number card. Card and receiving duplicate with inspector's stamp-in accompany stock to the production floor.

Shelves and tiers in the stockroom are uniformly lettered and numbered. Quantities received in the stockroom are taken from the receiving duplicate accompanying the truck load. Counting is done only in receiving.

Totepans are of the type that stack and still provide good access to stored parts. This permits small parts overflow to be easily stored in the bulk stock room. Simplicity and uniformity feature both stockrooms.

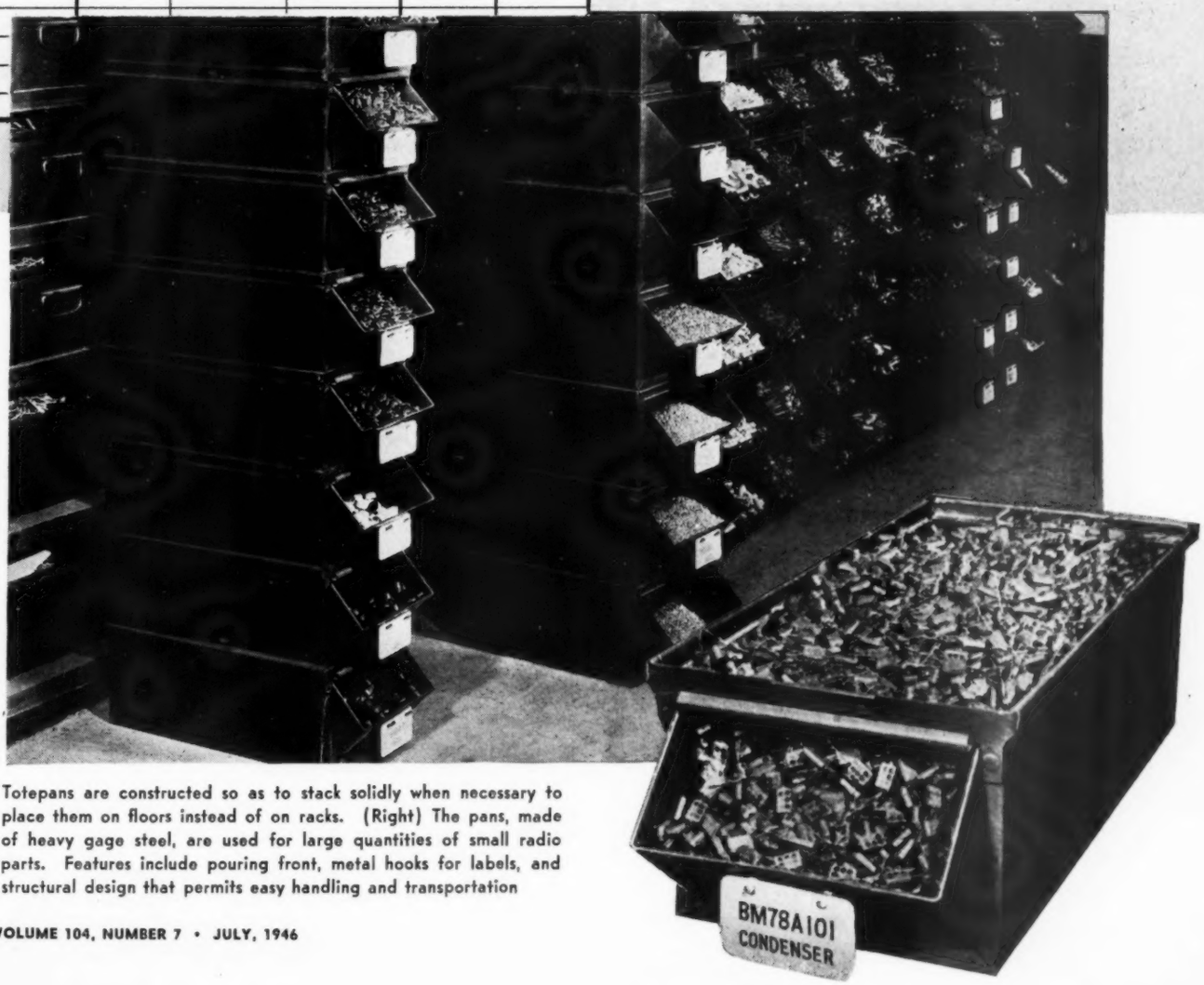
Connecting link between the planned materials and the stockrooms is the materials handling through production. Stock operations through each major production department or floor are the responsibility of a floor expediter and the stockroom superintendent. Predetermined quantities of parts to meet scheduled requirements are placed in totepans—if not used in original containers—and are set out in designated counter areas by stockroom clerks. Only required quantities need be kept in the marked areas. The stockman from the area or production unit concerned comes to the area, gets the parts, and sees that they reach the production unit.

One-Card Record Is Key to Better Stock Control at Detrola

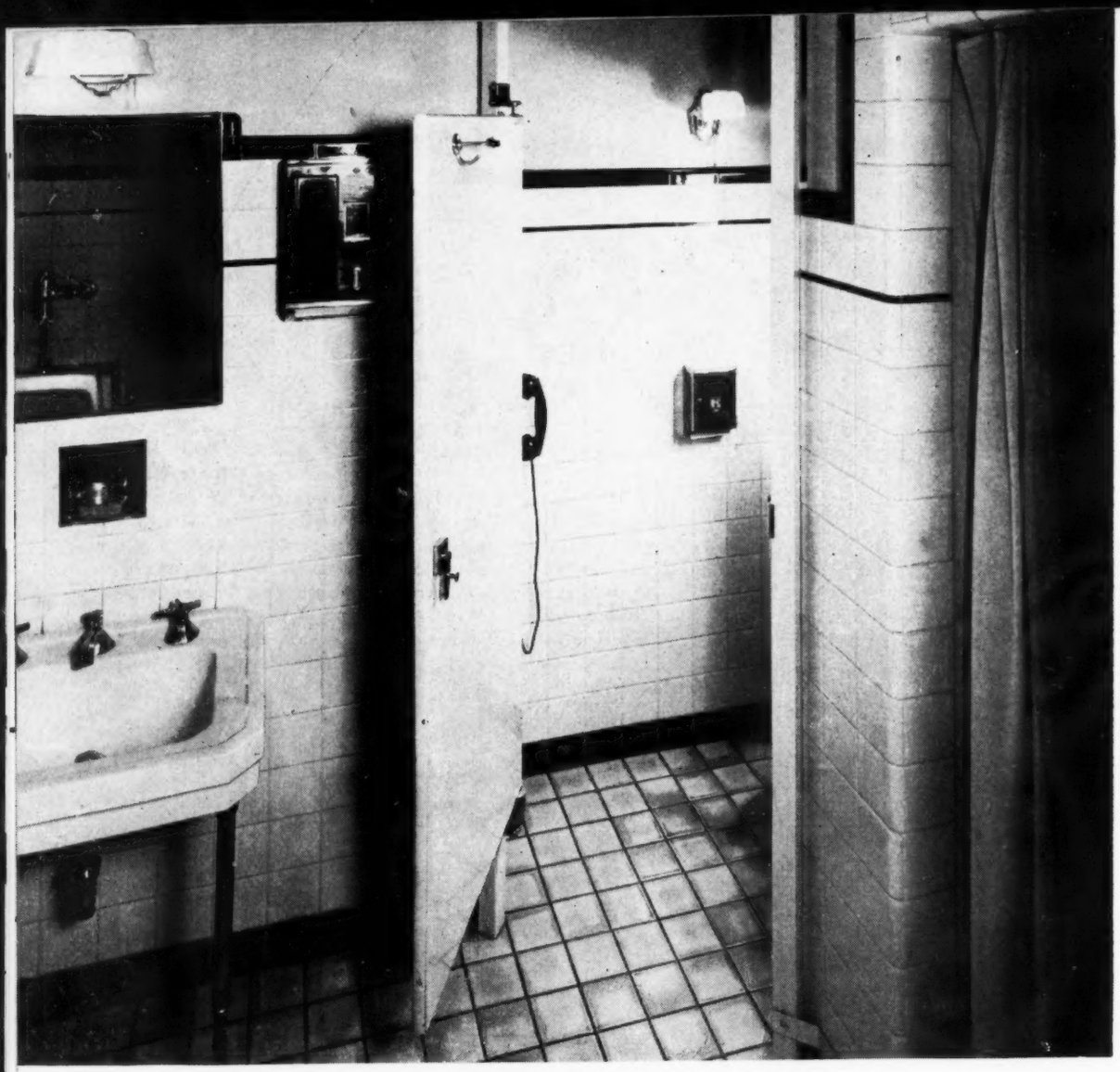
CARD NO. 1					PART NO. BN110M02	
Order No.	Model No.	Quantity	Usage	Total Usage	INSTRUCTIONS	
	612	5,000	5	25,000		
	6124					
	613					
	628	100,000	1	100,000		
					Total Requirements	Total on Order
					940,000	1,000,000

SCRAP		Monthly Receipts & Disbursements				STOCK STATUS
Quan.	Cum. Total	Month of	Quan. Used	Cum. Total	Receipts	
		Dec.			525,000	525,000
		Dec.	140,500	140,500		384,500
		Jan.			250,000	634,500

Heart of the simplified stock control system is the single-card stock record, which contains information formerly kept on four separate cards. A complete picture of stock status is provided, including description, part number, total requirements, total on order, vendors' names, purchase order number, quantities received, quantities used, and the balance. Columns in the upper portion of the card provide space for listing parts requirements of various models in production. Multiplying these entries by the number of units scheduled for production provides an accurate total of the number of parts needed to meet the schedule. Total number of parts used is computed in a similar manner. Number of units finished in a given period is multiplied by the number of parts in the unit. Details in both inventory and stock records are greatly reduced



Totepans are constructed so as to stack solidly when necessary to place them on floors instead of on racks. (Right) The pans, made of heavy gage steel, are used for large quantities of small radio parts. Features include pouring front, metal hooks for labels, and structural design that permits easy handling and transportation



Mirror, plumbing fixtures, tile floor, and tile wall in this washroom for men of the office force show how extensively emphasis is placed on cleanliness. For ultra convenience, even a telephone

WASHROOMS SET THE STANDARD IN THIS CLEAN PLANT

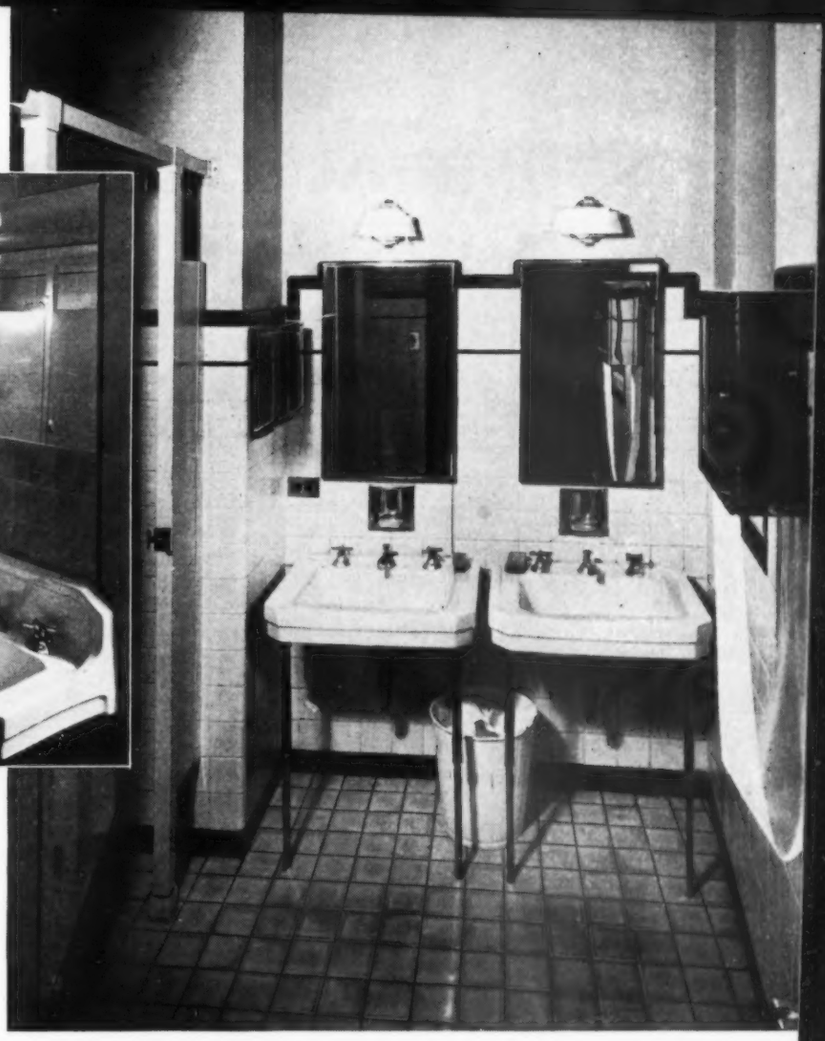
Good washrooms build employee good will in *any* plant. They are a *must* in a plant like the Reed Candy Company, Chicago, which makes things to eat.

Four beautifully complete washrooms serve this company's 100 employees, thereby setting the standard for cleanliness throughout the plant. The result is a product of guaranteed purity.

There is a bright, fresh appearance in all washrooms. Walls are light-colored tile to a height of 8 feet or more. Styled fixtures gleam with chromium trim. Soft natural light enters the larger washrooms through high glass-brick windows.

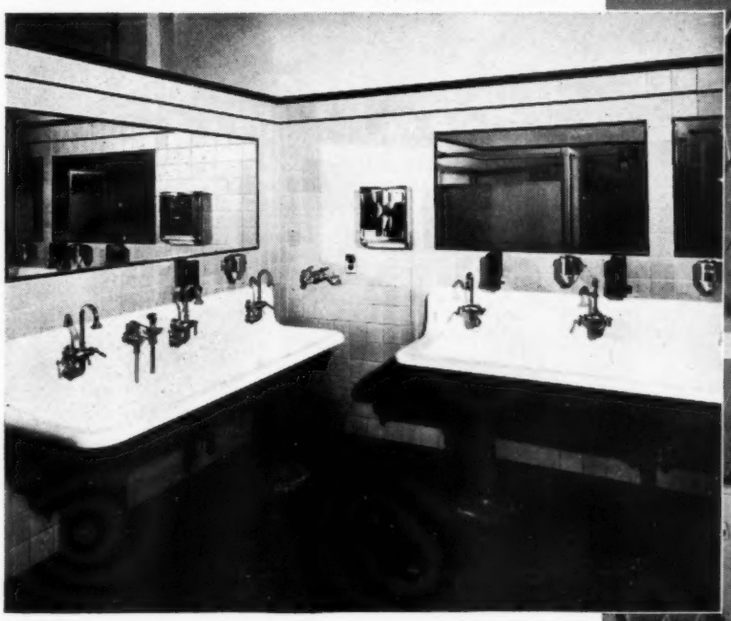
Sanitary facilities were selected for ease-in-cleaning properties. Supports for steel partitions and washstands offer minimum floor obstruction, and in the larger rooms water closets and washbowls are wall-hung. Janitors are specially briefed in washroom maintenance. Says Reed management:

"Clean and sanitary toilet rooms at all times call for a lot more than the mere swishing of a brush and the occasional use of some cleaner."



Views in two of the women's restrooms demonstrated the fact that each feature is designed to promote cleanliness. Full-length mirror at the end of the large room is an added convenience, which women employees appreciate. Partition with wall-mounted lavatories is not ceiling high, to allow better air circulation. Lockers are on the other side of the partition

Men's factory washroom (below) affords ample rooms for quick hand washing. Combination taps regulate temperature of the water. Water spout has spray head. Employees from the cooking rooms, where the heat often reaches 100 deg. F., enjoy frequent use of tiled shower stall (right). The stall has a private dressing compartment and is equipped with a seal



INDUSTRIAL RADIANT HEATING PAYS ITS WAY

Radiant heating has been applied in industrial processing for many years. Only in the last decade has its value in heating office and factory areas for worker comfort begun to be realized. Now it is also solving other related problems

Radiant heating of industrial buildings has passed beyond the experimental stage and is fast becoming common practice. Engineers are beginning to realize, moreover, that attainment of the assorted benefits of radiant heating are not limited to its application in office buildings, personnel quarters, laboratories, cafeterias, and the like, but are equally obtainable in manufacturing areas.

These conclusions are inescapable in the light of what has been done in industrial radiant heating in the past few years. Some idea of the progress that has been made can be gained from the review of specific radiant heating installations in industrial plants to be given in this article.

But first it will be helpful to point out the salient features of this newly recognized method of space heating. In actuality, radiant heating is an engineering principle that has been utilized for many years in manufacturing processes —the drying kiln presents a well-known example.

The major difference between radiant and conventional heating systems is the size of the heating element. In conventional systems, a quantity of small high-temperature heating units are employed; in radiant systems, one large low-temperature unit, nearly always the floor of the room, is used as the heating element. This is done by embedding one or more continuous runs of pipe beneath the floor surface and circulating a heating medium, usually hot water, through the system.

Despite this difference in the heating element, the materials comprising a radiant system, such as boilers, controls, and valves, are the same as those used for the conventional wet-type heating arrangements. Radiant heating is not a "packaged" commodity. The necessary components for a radiant heating system can be purchased from many reputable manufacturers.

One of the outstanding advantages claimed for radiant heat is its high degree of comfort. This is attributed by engineers to the scientific principles involved, wherein the objective is to control the amount and the manner in which heat is lost from the human body. Of the three principal ways in which the body loses its normal heat—convection, radiation, and evaporation, radiation accounts for the largest amount. As pointed out by The American Society of Heating & Ventilating Engineers, heat is produced in the body primarily by oxidation, and for perfect comfort the escape of this heat from the body should be regulated. By warming the cool surfaces surrounding the body—walls, floors, and ceilings—as is done by radiant heating, its radiation heat losses may be adjusted. To date the most widespread use of radiant heat in industry has been where the primary objective was employee comfort.

RADIANT HEATING PIPES ARE BURIED IN THE FLAT CONCRETE ROOF SLAB OF THE NEW DYE HOUSE AT VERNEY MILLS OF CANADA

Yet another feature of radiant heat is its partial solution to the problem of excessive air movement from convection heating currents, which might disturb delicate machine or testing apparatus settings in industries engaged in precision manufacturing operations. The air of a radiant heated room does not tend to be in a continuous state of agitation from convection currents because the principle of radiant heat is to warm floors and other cool surfaces, rather than the air. Radiant heat passes through the air without disturbing it mechanically, thus overcoming the effects of stratification. There is no dependence on convection currents to keep the room comfortably warm.

Humidity control in a radiant heated room is facilitated because moisture is not driven to the ceiling by stratification. Engineers say that the air temperatures are extremely uniform and remain at about the average temperature of the surrounding walls, floor, and ceiling. The atmosphere is described as being invigorating, too, because the air temperature is from 5 to 10 degrees lower than in a conventionally heated room, and stuffiness is eliminated. Control devices of any type may be used, and responsiveness of the radiant heating systems to controls has been reported as excellent.

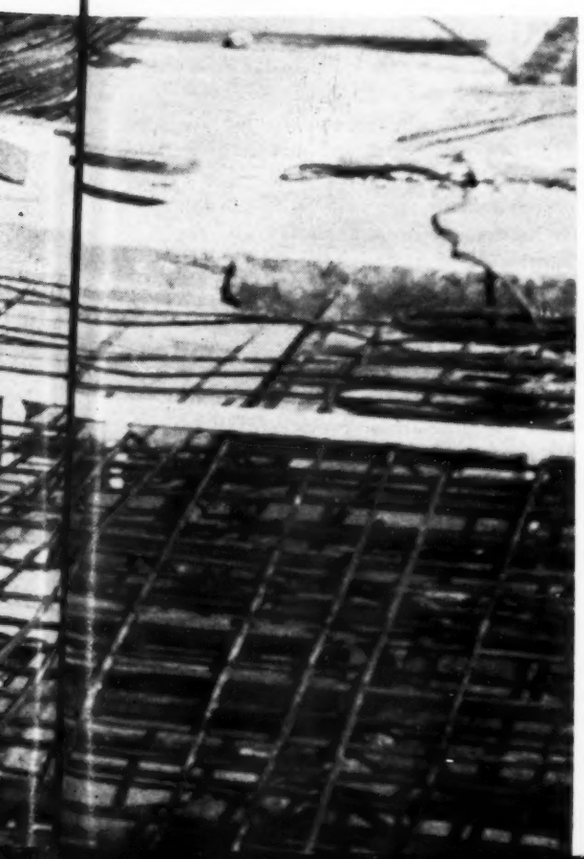
Most radiant systems for factory buildings are designed on a "zone" basis. In this design, certain zones of the floor area have individual heating panels (or systems), each separately controlled.

Frequently in a factory it becomes necessary to revise the production line layout, or relocate machinery, conveyors, ovens, and other manufacturing equipment. Radiant heating systems concealed in the floor permit these changes economically and without loss in value or function. If, for example, a certain area of the floor space is to be partitioned off for storage, and heating requirements were to be less than in the occupied area, the partitions would be arranged so as to enclose one or more of the floor heating panels. The hot water supply into this panel then would be reduced by a balance valve.

Similar regulation is possible for unused portions of uninterrupted floor areas where heating is unnecessary, or *vice versa.* In one plant, for example, a small floor heating panel has been installed directly in front of a line of machinery, the only location in the building where heat is required. The workmen at these machines are kept comfortable without the necessity for heating the entire building.

Frequently, when radiant heat is being considered, the question arises regarding heating the plant during periods of inactivity. It is possible with this system to reduce (thermostatically or manually) the flow of hot water into the buried coils, and still maintain sufficient warmth to prevent chilling. Restoration of heat to comfort conditions upon resumption of operations is quick and economical.

The foregoing has only briefly demonstrated the principles governing the design and operation of industrial radiant heating systems. An even better appreciation of the various possibilities for beneficial application of radiant heating in industry can be obtained from a look at some actual plant installations. The following cases illustrate a diversity of heating problems. and show how effectively radiant heating has provided the answers.



Verney Mills of Canada, Ltd., Granby, Quebec

Radiant heating was recently installed both in a new dye house and in a new building that houses spinning and warping operations. These structures contain a total of about 65,000 square feet of floor space.

According to the engineers on the project, the utilization of radiant heat in a dye plant will change many of the practices previously used for ventilating such buildings to remove fog and condensation, which are a continual problem. The wrought-iron radiant heating coils embedded in the concrete ceiling of Verney's dye houses are virtually eliminating fog and preventing condensation on the ceiling.

The more common practice of installing coils in the floor was followed in heating the first story of the spinning and warping building. In these operations the handling of raw textile fibers and spinning them into yarn usually produces a severe lint condition. Consequently, air agitated by convection heating currents would keep the lint particles constantly in motion. Verney engineers found that radiant heat, with a minimum of convection currents, permitted the dust and lint particles to settle out on the floor instead of being blown around the department.

Thompson Products Company, Detroit

Here the personnel building, containing 10 offices and a medical department, is being heated by a radiant system.

Steam from the company's boiler plant is used to heat the hot water for the system. Most radiant heating systems to date are of the forced-feed, hot-water type, but this design does not prevent factories equipped with steam boilers from using radiant heat. As at Thompson, hot water can be provided simply and economically by means of small and compact heat exchangers.

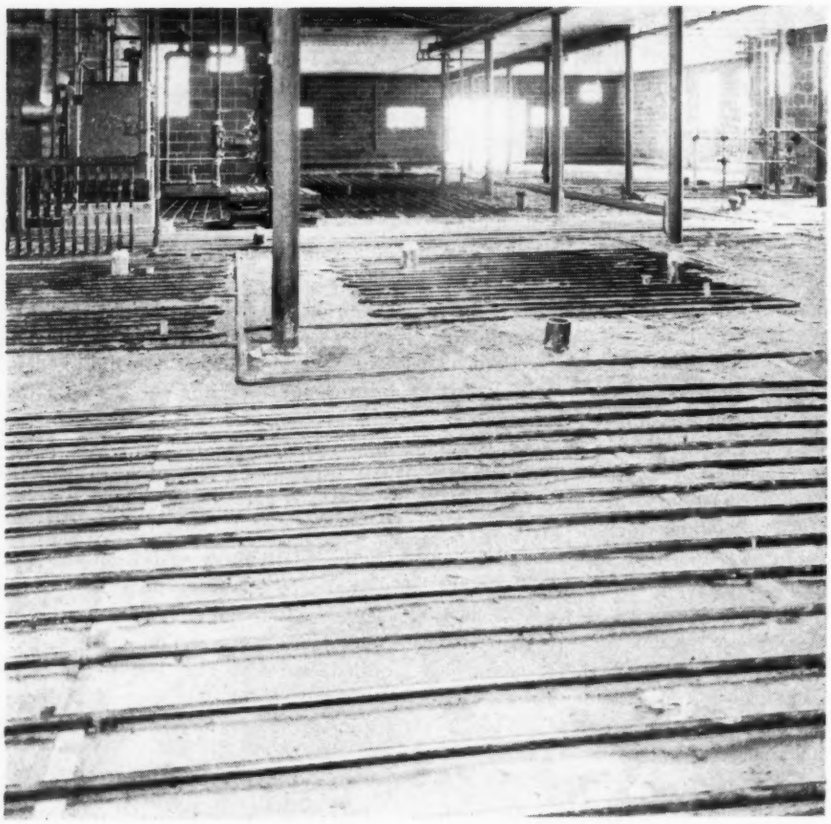
In this particular system, 1-in. wrought-iron coils were embedded in a concrete floor slab. Terrazzo was laid on the concrete in the medical department, while the floors in the other areas were covered with asphalt tile.

A. M. Byers Company, Pittsburgh

A radiant heating system was recently installed by this company in one of its factory locker rooms. This system has achieved considerable success in establishing atmospheric conditions that permit employees to change clothes and wash in comfort.

Halliburton Oil Well Cementing Company, Duncan, Okla.

Two gas-fired boilers, operating in tandem, are used to supply hot water for a radiant heating system in the build-



To obtain a clean product, free of dust and dirt, the Medical Products Company employed radiant heating, which does not rely on convection currents of air for heat distribution

At Superior Mold & Die Company the entire building of 6000 square feet area is kept warm even in zero weather by radiant heating. Here, pipe layout before concrete floor was poured

ing that is being used for the assembly of equipment.

The floor area of this building is 32,500 square feet. Constructed of corrugated steel siding, and having a sawtooth roof, its heat losses were calculated by design engineers at 2,300,000 B.t.u. per hour.

The building was divided into 6 individual heating zones, and 21 wrought-iron pipe grids were positioned on a sand and gravel fill and embedded in a concrete floor slab. Separate hot-water supply mains run from the boiler manifold to each zone.

Most of the heating grids were laid out on the basis of 1-in. pipes, spaced on 18-in. centers, which were welded into 2-in. supply headers, with 1¼- and 1½-in. returns. Each grid has a return-line control plug valve installed in the floor adjacent to the grid.

Temperature readings made by the architect while the system was in operation revealed there was less than ½ degree difference between the temperature 6 inches above the floor and that 22 feet above the floor. He further reported that his system provided a pleasant type of heat, and the workmen were free from colds, rheumatic pains, and influenza during the short time the system was in operation.

Medical Products Company, Chicago

In a plant such as this, housing manufacturing pharmaceutical chemists, cleanliness is one of the essential services because of the nature of the end products.

Radiant heating's operational principles were used here to solve the problem of dust and dirt. Because convection currents are minimized with this type of heating, dust and dirt particles are not circulated by the air.

The radiant pipe coils in this installation are of serpentine design, and are fabricated of 1- and ¾-in. pipe. Serpentine designs usually are selected for smaller heating panels because the overall frictional resistance to water flow is lower when the panel is smaller. In larger areas, however, grid designs are used because they provide excellent thermal distribution with a relatively light hydraulic load.

Superior Mold & Die Company, Stow, Ohio

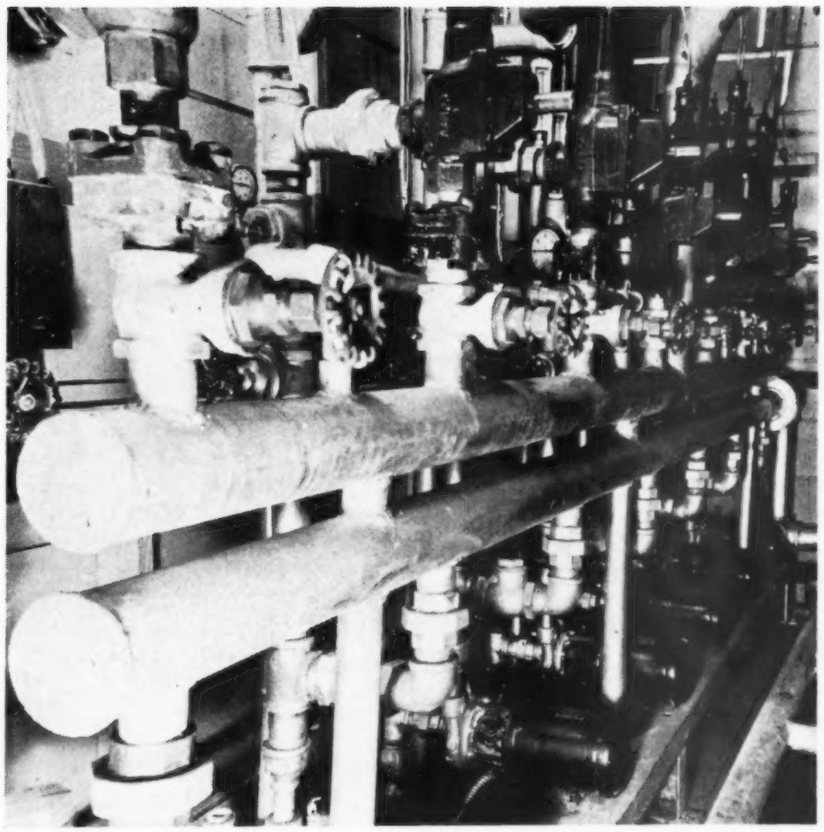
This small plant has used radiant heating in a single building which combines office and factory areas on one

floor all under one roof. Total floor area is about 6000 square feet. There is no basement.

The heating pipes, of wrought iron, are mostly 1¼-in. size. They were fabricated into grids, positioned on gravel, and then covered with a concrete floor slab.

Temperature of the hot water supplied from a coal-fired boiler is thermostatically controlled, and the three circulators which force the water through the system also are regulated by thermostats.

In the design of any radiant heating system, the water temperature is usually planned at 140 deg. F. so that the floor slab will be about 85 deg. F. The management of this company states that during zero weather last winter, opening the large shipping doors of the shop did not affect comfort conditions inside. An average temperature of 76 deg. F. was maintained in the offices, and from 65 to 68 deg. F. in the shop, with the hot water supply kept at 135 deg. F. Furthermore, only 95 tons of coal were consumed during the heating season, September 1, 1945, to the middle of May, 1946. This was considered very reasonable, particularly because of the large area of glass on all sides of the building.



Materials used in radiant heating systems are the same as for the conventional wet-type. Here are circulators, mixing valves, and headers at Halliburton Oil Well Cementing Company

The Murray Corporation, Towson, Md.

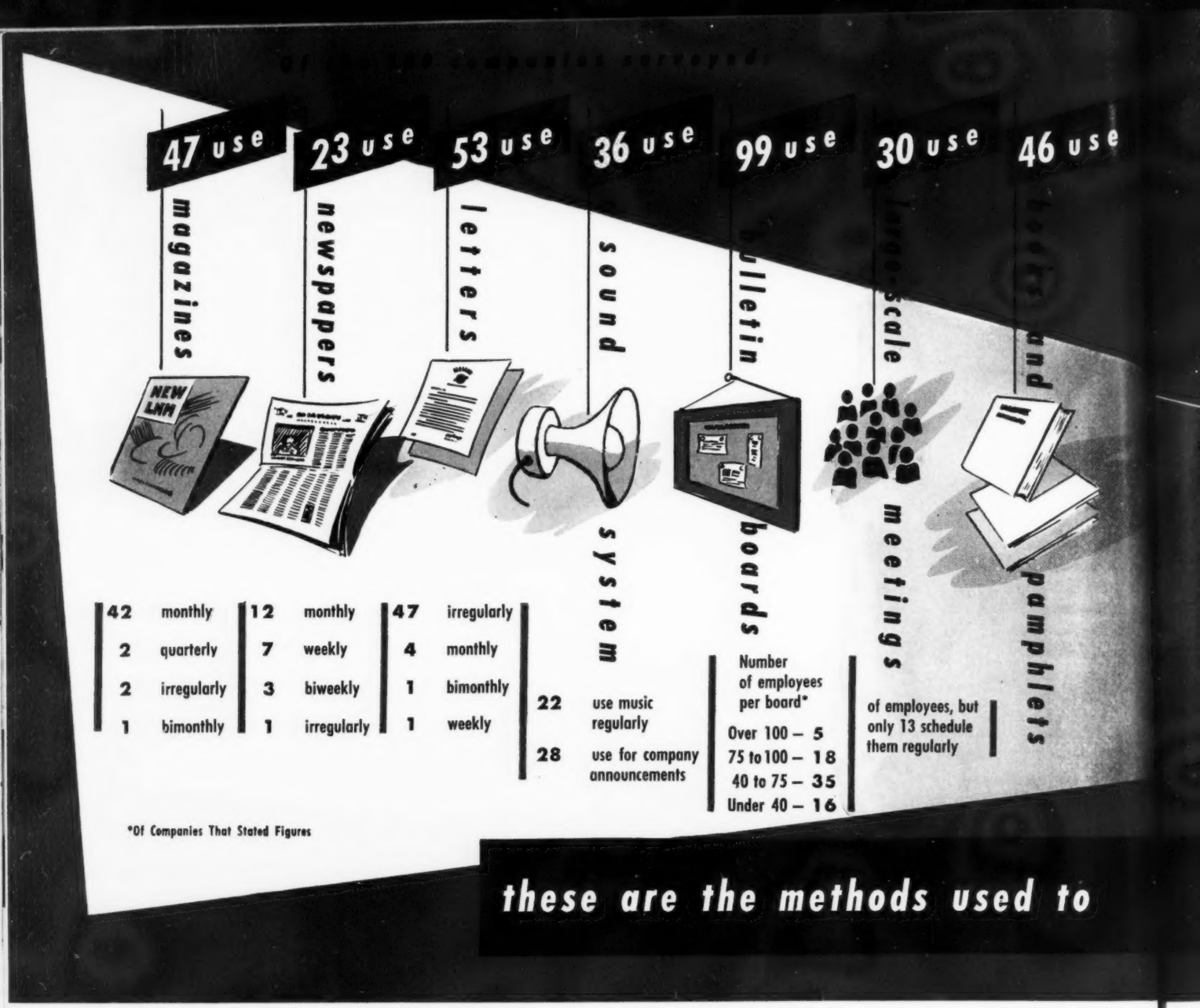
A one-story plant addition of 5000 square feet floor area was equipped with a radiant heating system in its 6-in. concrete floor.

After the coils were positioned on a gravel fill, and before the floor slab was poured, bench marks were made on the overhead beams to indicate pipe locations so that anchors for future machinery foundations would not interfere with the piping systems.

Absence of exposed heating units in this plant permits full utilization of its floor space and causes no hindrance to the storage or flow of materials. Employees working in the center of the manufacturing area are just as comfortable as those who are near the outside walls.

Evidence as to the uniform horizontal and vertical distribution of radiant heat was forcefully illustrated at this plant by the fact that unit heaters which were installed to take care of anticipated high heat losses through the monitor windows never "kicked on" because the radiant system was able to handle the losses satisfactorily.

Personnel building at Thompson Products Company's Detroit plant uses radiant heating for offices and medical department. Terrazzo floor covers the pipes which heat treatment room



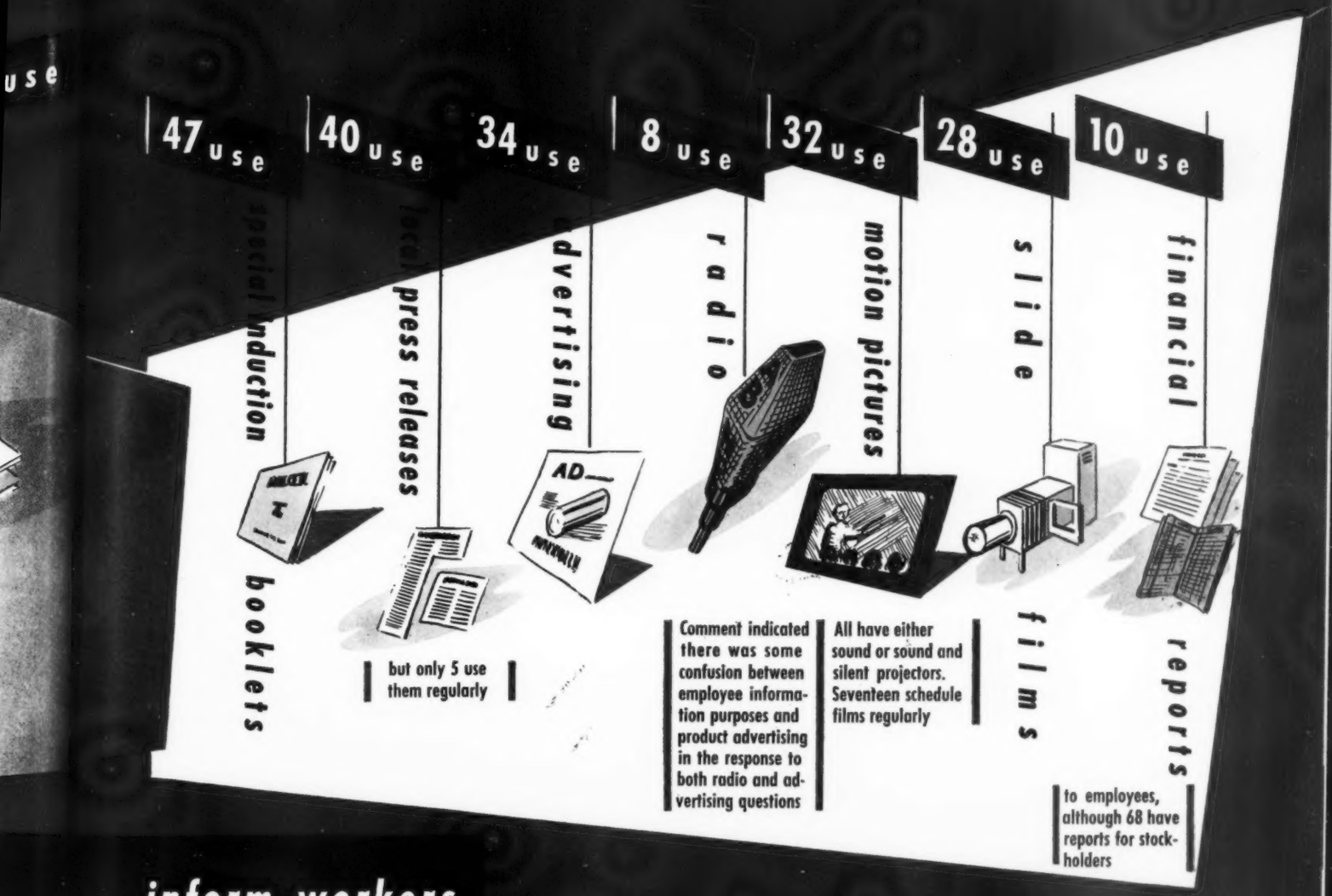
HOW MANAGEMENT IN 100 PLANTS GETS INFORMATION TO WORKERS

It is doing a good over-all job. But survey reveals gap in reporting on the economic facts of life—and in telling of changes in products, materials, and sales

Cloak-and-dagger secrecy isn't as prevalent in American industry as left-wingers charge.

To keep its workers informed, the average company, among the 100 covered in FACTORY's employee information survey, uses five of the fourteen methods listed in the chart shown directly above. And it employs three of the four methods of reaching foremen regularly.

Formal methods of course, do not include informal word-of-mouth information seeping down from the top. Industry's rather thorough indoctrination of foremen and widespread regular informative sessions for foremen indicate that word-of-mouth is an important channel, particularly in small companies. The survey, too, reveals one or two


47 use
special induction booklets
40 use
press releases
but only 5 use them regularly
34 use
advertising
AD
8 use
radio
Comment indicated there was some confusion between employee information purposes and product advertising in the response to both radio and advertising questions
32 use
motion pictures
All have either sound or sound and silent projectors. Seventeen schedule films regularly
28 use
slide films
10 use
financial reports
to employees, although 68 have reports for stockholders

inform workers

"blind spots"—such as financial reports to employees—which industry is not using generally.

That there is still growing interest in information program is shown in a number of comments that new publications were being considered or were planned, and in the remarks of several personnel directors who want more information on visual aids.

POPULAR METHODS

Bulletin boards are the most widely used medium. Only one company indicated that it did not use boards. There were 70 magazines and newspapers reported among the companies. Forty-six companies use booklets and pamphlets for employees, and 47 have special induction booklets.

Product information—news of the thing on which his bread and butter depend—is the phase of employee information on which industry falls down hardest. Less than half of the responding companies give their workers announcements of new models. Only 15 tell anything of cost and price reductions. Only 22 tell the story on sales gains—the best measuring stick workers have of their company's progress and their chances of continuing to work.

On the types of policy on which employees are informed, most companies check at least half of the 21 classifications, although a few could mark "yes" on only one or two. A still-lingering hesitation on the part of management to discuss profits and their relation to wages, technological developments, and the economics of their industry and the company is clearly revealed by the survey.

Management takes foremen into its plans, informs them on policy and products, and meets with them regularly, FACTORY's survey shows. The average company uses three of the four methods —training sessions, special communications, meetings, or dinners—to reach its foremen regularly. Sixty-seven companies have training programs; 79 issue special letters or pamphlets; 92 have meetings; and 67 have dinners at which foremen meet top management.

Widespread use of meetings and

the score on policy information

THE QUESTION: Corncerning which of the following items do you give policy information to your employees?

OF THE 100 COMPANIES SURVEYED, THE NUMBER REPLYING	'YES' WAS:
hours, vacations	87
shutdowns	73
layoffs	71
seniority	67
discipline	66
suggestion systems	65
history of the company	64
grievance procedure	62
job classification	60
shop regulations	59
union contracts, changes	58
training opportunities	58
efforts to stabilize employment	56
chances for promotion, personnel records	55
personalization of management (presenting top management to employees as human beings)	53
company's benefits to community and the nation	48
grievance decisions	45
technological developments	30
company point of view in labor disputes	30
profits and their relation to wages	26
economics of the industry and the company	24

training for foremen, plus the foreman's usually close contact with his superintendent or manager, shows that management realizes the importance of keeping foremen informed—and sees to it that they get the information.

PUBLICATIONS USED

Monthly magazines are the most popular publications, a breakdown of the media section of FACTORY's information survey shows. Forty-two companies have regular monthly magazines. Monthly newspapers, 12 of them, take second place, and 17 weekly newspapers are in third place. The personnel department gets the job of editing, usually, although 6 of the companies have 2 full-time editors and 21 have 1 editor.

The survey indicates that the chief advantage of magazines over letters and meetings lies in their regularity. Fifty-three companies reported using letters, but only 7 issue them regularly. Comment showed that many of the letters were sent directly to employees' homes —probably the most effective method of insuring that they'll be read. Similarly, 30 companies say they hold large-scale meetings of employees, but only 13 schedule them regularly. Chief comment on the letters and meetings was that they were used to "meet emergencies" or "when necessary."

Thirty-six companies have loudspeakers throughout their plants, 28 using them for company announcements, 22 using music regularly to relieve monotony. One interesting sidelight on the letters and sound systems is that presidents of 22 companies sign letters going to employees, but only 4 talk to them over public address systems.

A majority of companies using bulletin boards had 1 board for each 50 to 100 employees. Size of the boards, comment indicated, was set by the number of messages that must be displayed, space available, and the size of the department in which the bulletin board was located.

Books and pamphlets on company policy, safety, and employee plans were used by 46 companies, induction booklets by 47. Most companies, even those that indicated that they do have press releases, do not make best use of local newspapers as a channel to reach employees. Only 5 of the 100 responding companies gave releases to the newspapers monthly, weekly, or daily on a regular schedule.

Comment on slide films and motion

pictures indicated that use of visual aids had slipped since war production programs have ended. Safety was the most frequent subject. Four of the companies indicated that they made their own films; 8 rented from commercial agencies; others obtained films from large industrial companies, insurance companies, or government agencies.

Biggest "blind spot" revealed in the survey was the reluctance of industry to discuss economic questions with employees. The attitude is clearly shown in the types of policy on which industry informs employees and in the media survey. Although 64 companies publish financial reports for stockholders, only 10 distribute them to both stockholders and employees.

POLICY INFORMATION

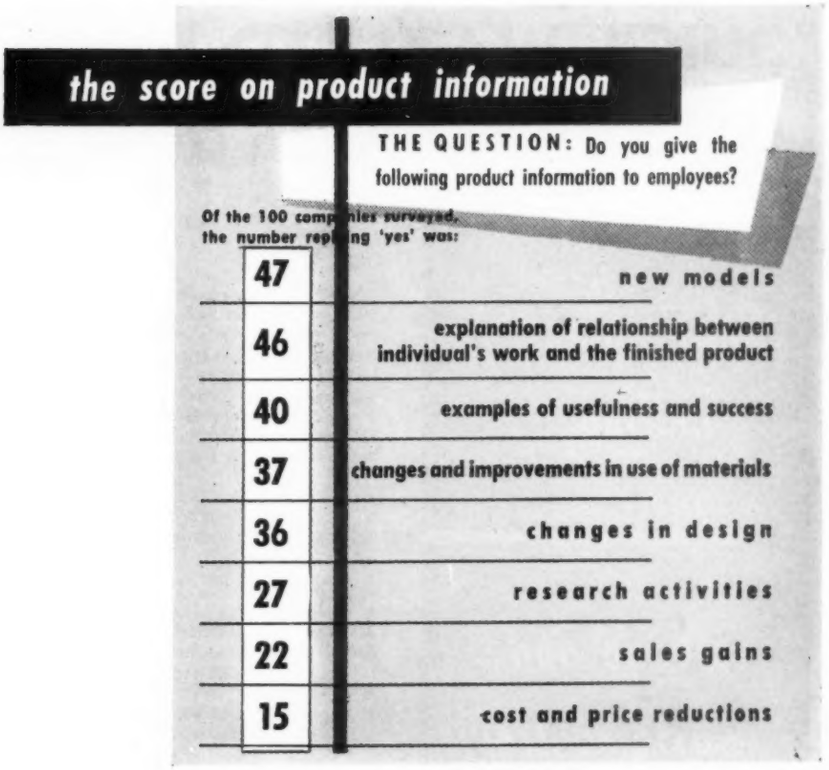
Effect of unions on management is shown in the high response on union contracts, shop regulations, grievance procedure, discipline, job classification, seniority, and hours and vacations among the types of policy on which industry informs employees.

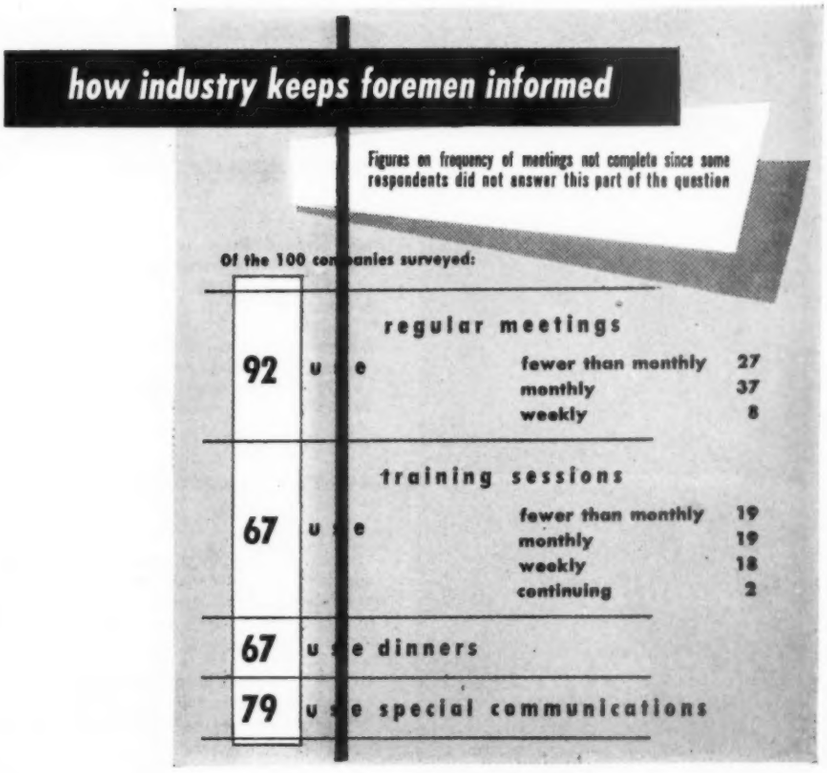
Biggest opportunity to win understanding of employees revealed in the compilation is in telling them of technological developments, economics of the industry and of the company, the profit story and its relation to wages. and the company's point of view in labor disputes.

Although only 30 of the companies said they inform employees on the company viewpoint in labor disputes, this figure may be misleading in that only a minority of the industrial companies had had major labor-management conflicts recently.

PRODUCT INFORMATION

The companies, 47 of the 100 responding, which do announce new models to employees, usually do show the relationship between the individual's work and the finished product. Apparently most companies, however, overlook the possibility of building morale and assuring the worker of his future security by telling him of research activities or giving him examples of the usefulness and success of his product. Similarly, the story behind changes in design or changes and improvements in materials is not announced in advance or spread generally through the plant so employees can follow management efforts to improve quality or spur sales.


the score on product information
THE QUESTION: Do you give the following product information to employees?
Of the 100 companies surveyed, the number replying 'yes' was:
47 new models
46 explanation of relationship between individual's work and the finished product
40 examples of usefulness and success
37 changes and improvements in use of materials
36 changes in design
27 research activities
22 sales gains
15 cost and price reductions


how industry keeps foremen informed
Figures on frequency of meetings not complete since some respondents did not answer this part of the question
Of the 100 companies surveyed:
92 use regular meetings
fewer than monthly 27
monthly 37
weekly 8
67 use training sessions
fewer than monthly 19
monthly 19
weekly 18
continuing 2
67 use dinners
79 use special communications

"QUICK WAYS" TO LOW-COST OPERATION

materials handling

1. Machines in the plant of one automobile manufacturer are served by light overhead chain conveyors which deliver work to the operators, and also carry the finished pieces to the next inspection station.

2. Use of pallets with fork trucks is eliminated by bar which rests on the block between the forks. Bar is made of two concentric pieces of pipe, with inner spring to force prongs against the floor. Because it slants backward, bar does not affect forward motion, but when truck backs up, prongs dig into floor, and load is pushed off forks.

3. A mirror manufacturer increased production nearly 60 percent and cut his working force almost in half when he installed steam-heated belt conveyors, so timed that chemical deposition is com-

salvage and waste control

1. Careful ordering and scheduling of proper widths of strip steel for stampings cut side loss for one company from 1.61 to 0.94 percent, effecting a saving of $4250 per year.

2. Grading collected wastes before sale as scrap enabled one manufacturer to increase the sale value of his salvage by more than 300 percent—400 percent on rags, and from 200 to 1000 percent on various grades of waste paper. The value of tool steel, when separated from regular grades, jumped from a few cents to several dollars a pound.

3. One rubber manufacturer saved $5000 a year by using a different shape of preparation, thereby reducing the waste in cured trim or rind which was needlessly vulcanized.

industrial power

1. A paper manufacturer scheduled the starting times for machinery in the plant so as to avoid the usual peak loads at the start of shifts and after lunch. Result was a $200 reduction in the monthly power bill.

2. Motor failures caused by excessive steam and moisture in a southern textile mill were stopped by the purchase of motors with specially designed insulation. The high repairs bills of former days have been entirely eliminated.

3. Cause of the demand peaks in a small plant was simultaneous operation of a 25-hp. motor and a 30-kw. electric oven. A timing relay on the oven to permit it to draw current for 7½ of every 15 minutes, and an interlock on the motor, which was used only a few minutes each hour, cut the

quality control

1. A $300 microscope is saving about $50,000 a year for a manufacturer of woolen fabric for men's clothing; no longer are incoming shipments of fiber too coarse or too fine.

2. One food manufacturer is using a photo-electric egg tester which eliminates errors of human judgment in grading the condition and freshness of eggs. Machine measures, among other things, the roundness of the yolk, automatically rejects undesirable eggs.

3. A cannery uses a simple, portable, optical device to check sugar content of canning syrups quickly and accurately, right at the kettle.

4. Permeability to moisture of paper stock is tested by one company with a solvent which is

buildings and services

1. Fireproof rooms for motor-starting and control equipment in a color works cut maintenance costs, and increased safety by reducing the fire hazard from grinding pigments and fumes generated by the paint solvents.

2. A brick wall at the plant of an oil company became so saturated during a wet spell that moisture was transmitted to the interior of the building. Repetition was prevented by spraying the exterior with a thin mixture of portland cement and water (1 part cement, 3 parts water), under an air pressure of 90 p.s.i.

3. Combination brick and sliding steel sash permitted easy installation of inexpensive screening in a factory where summer insects were found particularly troublesome.

Again this month *Factory* briefs cost-cutting ideas, each of which has helped some plant in its attack on operating costs

pleted just as mirrors are transferred to a slat conveyor which carries them through rinsing, drying, and spraying operations.

4. Lack of sufficient headroom for turning over large weldments by conventional crane methods led a Chicago manufacturer to adopt a hand-operated roll-over machine. Weldment, which must be machined on both sides, is held in chucks and pivoted about its long axis from supports with worm gears which provide enough leverage to permit one-man operation.

5. Two flexible steel straps form a slide which solves the problem of transporting partially assembled filter cores from one work station to the next, which is on the floor below. A curve in the slide causes the unit to be deposited, flat surface down, on a belt conveyor, so that it is all ready for the next operation.

6. Ball-top pedestals in a shipbuilder's plate shop add to the speed and efficiency of handling large steel plates. The ball-tops hold plates at working height and permit easy movement, while the pedestals allow the operators to walk unhampered throughout the entire shop area.

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4. A firm that uses a large quantity of metal stampings has cut its waste cost by setting up an additional department to make small, salable stampings, such as washers, from what would normally be scrap material.

5. An automobile manufacturer saved many thousands of dollars a year by specifying the size and type of lumber to be used in packing cases of goods purchased, so that 100 percent of the "scrap" from the cases could be re-used without so much as having to trim a single piece.

6. One plant found it profitable to spend $14,000 a year separating and grading scrap, until it invested a few hundred dollars in additional scrap containers, so that separation is now automatic at the point of origin.

7. A glove-maker turned waste into profits by adding a sideline. What once was scrap is now used to make knife cases, watch covers, watch straps, and change purses.

8. Installation of a centrifuge for the recovery of oil from chips and cloth increased the salvage of re-usable oils by 400 percent in a New England metal-working plant.

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demand by 64 percent, with a corresponding saving in the power bills.

4. Savings of $850 a year resulted when an eastern metal-working plant invested $1500 for capacitors to increase the power factor.

5. Instead of running feeders from substations, each of which supplies all motors in a given area, one large plant has found it pays to carry motor circuits back to the substation switchboards, where each is protected by its own circuit breaker. Saves time in locating fuses, and any trouble is confined to just one circuit.

6. A cannery was able to use a lower grade of coal after installing stokers, thereby saving $1500 a year on fuel, plus freeing one man.

7. Operating two pulverized-coal-fired boilers at test efficiencies by automatic meter controls, instead of manually, returned costs to a sugar refinery in less than nine months.

8. Installation of two synchronous motors with leading power factors enabled a paper mill to increase the efficiency of its power consumption, cut costs by $180 per month.

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absorbed in the same manner as water would be, but is six times as fast, speeding up necessary, frequent tests from one hour to 10 minutes, and thereby eliminating production delays.

5. One company keeps records of every weld made. They show number and type of part, number of sketch followed for weld, number of welding tool used, type of rod, and amperage used. Analysis of these records enabled the firm to develop a "foolproof" schedule for welding which guaranteed uniformly high quality.

6. One large company was troubled with rejects resulting from improper color matching. Not until the color-matchers were subjected to biophotometer tests for color blindness was the real cause disclosed—40 percent were substandard. Daily administration of 30,000 units of vitamin A to each man resulted in cutting rejections from 1.7 to 0.3 percent within 3 months, with an annual saving of more than $5000.

7. In-process inspection stations helped one firm localize responsibility for substandard work, and prevented many dollars from being spent for further processing of defective work.

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4. One small plant finds that it can trim costs by letting building maintenance pile up until an off-day during slack times, then having the work done on outside contract, thus cutting the size of the standing maintenance crew.

5. Lamp-type annunciator near the telephone switchboard, with a toggle switch cabinet at the information desk or main gatehouse, informs operator of the departure of key personnel by flashing the light corresponding to the name of the absent executive, thereby saves time often wasted in trying to locate people who are not in the plant at the time an incoming call is received.

6. The dust hazard in a lithographing department was materially reduced by eliminating sharp corners and installing a wood-block floor.

7. Fiberized mastic floor covering in sheet form resists wear from constant scrubbing and rinsing in a plant where heavy syrups must be removed from the floor daily.

8. One plant saved floor space and cut down-time by locating lavatory facilities in a specially constructed mezzanine, where they were readily available to the men in the working area.

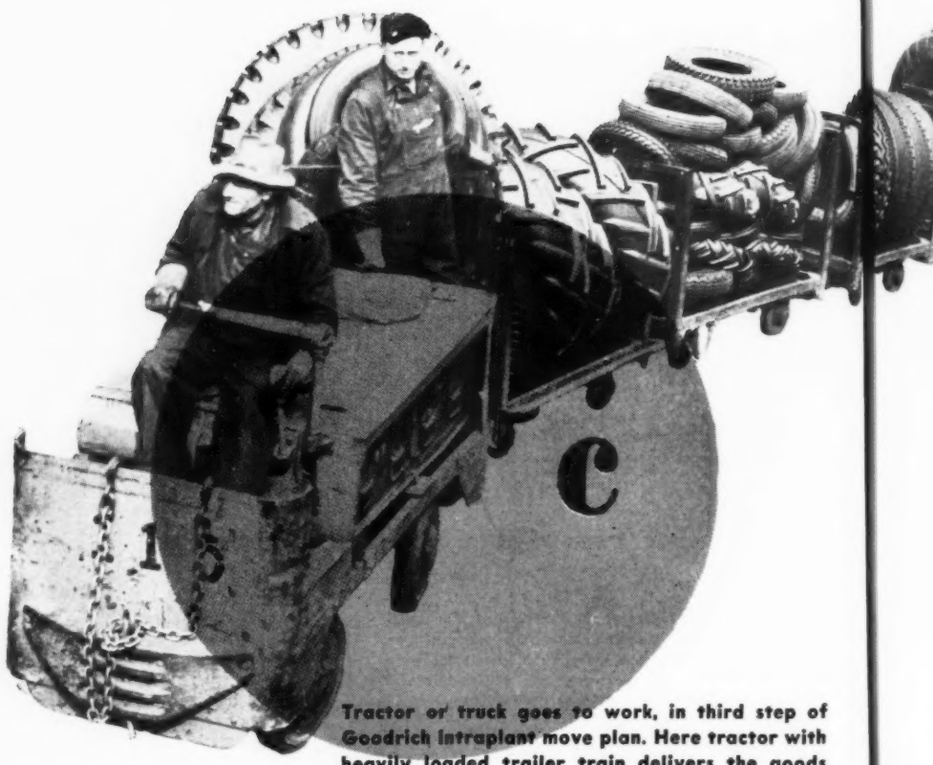
Goodrich's intraplant truck dispatch system functions with A-B-C simplicity. Call for service is received by telephone at central station, relayed at once to substation nearest the j

DISPATCH SYSTEM CONTROLS INTRAPLANT TRUCKING

Materials and parts get where they are going fast at the B. F. Goodrich Company, Akron. The company's industrial transportation and motor truck department has worked out a dispatch system which sees to it that no time is lost waiting for the movers.

The factory service tractors and trailers travel into every production and storage area of the plant—which covers 5,000,000 feet of floor space—and are capable of handling 235,000,000 pounds of material a month, sufficient to load 4000 5-ton boxcars.

Combining quick delivery, taxi, truck, and railway service, the equipment used consists of 75 lift trucks, 7 fork trucks, 10 locomotive-type tractors, and 3 chisel-type tractors for hauling large rolls; 500 industrial trailers,



Tractor or truck goes to work, in third step of Goodrich intraplant move plan. Here tractor with heavily loaded trailer train delivers the goods

including 90 cage trailers used in handling bulky material; between 6000 and 7000 pallets, used in carrying oil, reclaim rubber, and many other items; and approximately 25,000 skid boards, racks, and other miscellaneous handling equipment.

From the department's headquarters a dispatcher—one is on duty every hour of the day and night—directs the movements of the tractors by the telautograph system, which has connections at four different stations throughout the plant. A call comes in by telephone from a department where there is hauling to be done. The dispatcher relays the order by telautograph to the appropriate station, and the foreman in charge of the station sends the most convenient tractor of the type required.

A two-way public address system connects the headquarters office with the motor transportation department, which operates the company's outdoor fleet of trucks. This makes possible prompt transportation of goods brought to the factory from railroad stations or elsewhere to the departments where they are needed, and also facilitates pick-up of materials left at loading docks by the internal transportation system.

The locomotive-type tractors pull trains that frequently consist of eight to twelve trailers. The layout of the plant is well adapted to train operation. There are two main transportation arteries—one on the basement and the other on the [illegible] floor level—which run practically the length of the factory. Auxiliary runways and large elevators aid in the ease of moving loads readily to any department. The runways are wide, and are kept clearly marked by painted lines. An efficiently operated good housekeeping program prevents the accumulation of dirt, oil, or litter and their dangerous effects.

On the same floor as the dispatcher's office are a well-equipped repair shop—the company does all its own maintenance on transportation equipment—a battery service station, and a stockroom in which a supply of all truck and tractor parts is kept on hand to prevent the possibility of delay in making needed repairs to any piece of the materials handling equipment.

Tractors are sent to the maintenance department on a regular schedule—once every two weeks—for a thorough grease job. Major repairs are made when breakdowns occur. In the maintenance department, too, alterations are made to tractors from time to time, to meet some special need. For example, one tractor recently was equipped with a crane of special type so that it can pick up a large roll of fabric by means of pins inserted in the center of the roll, thus avoiding the possibility of damage to the fabric.

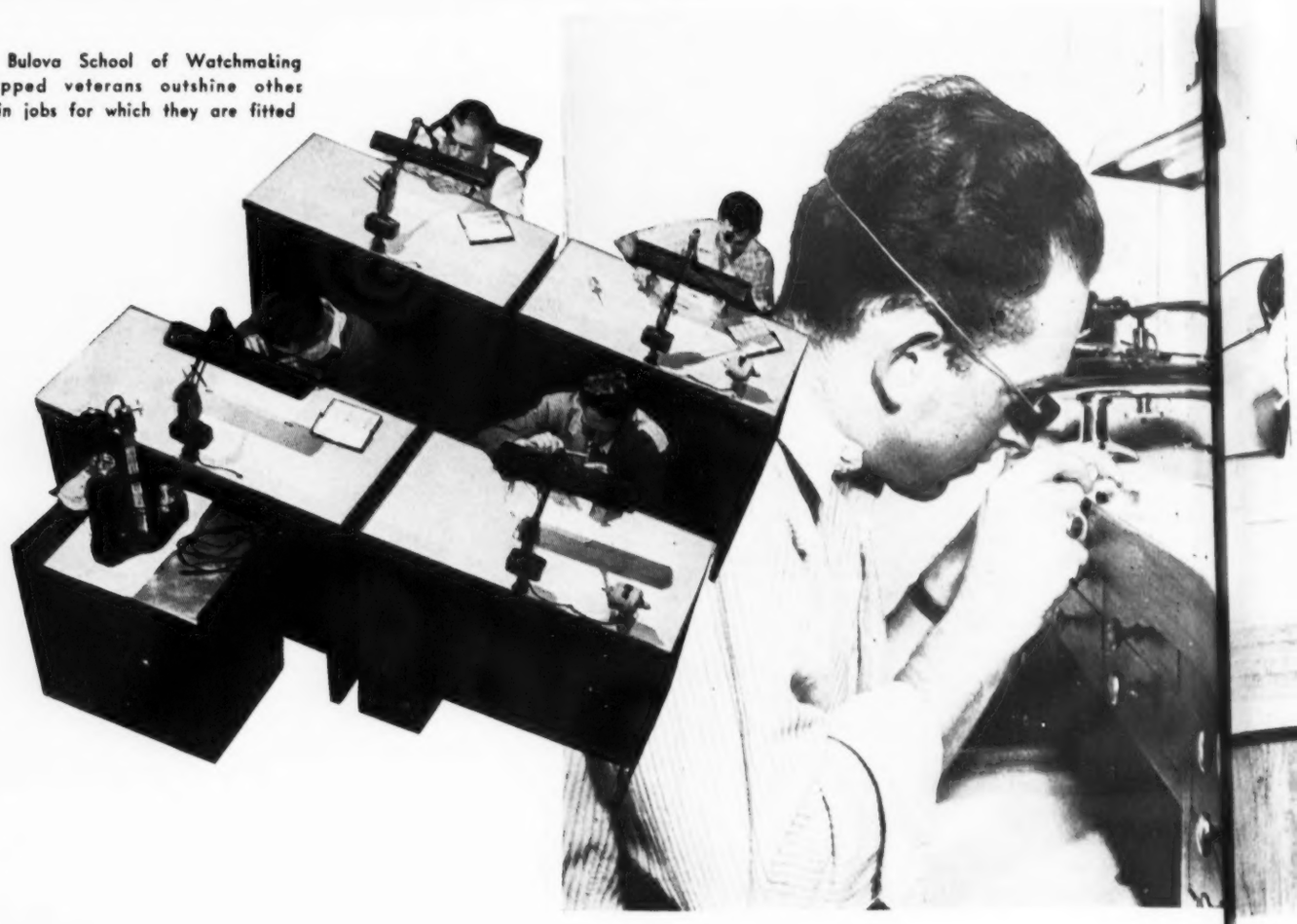
Two hundred batteries, similar to automobile batteries but larger, are kept charged at all times. It is possible for a tractor operator to leave a battery for recharging and replace it with a charged battery in a minute and a half to two minutes. One of the reasons for such quick action is the specially designed roller-top transfer table, upon which a battery can be readily rolled from tractor to charging table or *vice versa*.

OPERATORS ON INCENTIVE

Tractor operators are thoroughly trained men, with an intimate knowledge of the speed and maneuverability of their vehicles and of the routes over which they operate. The 300 operators and mechanics in the department work under an incentive piecework system.

The department has an enviable safety record, and contributes to safety throughout the plant by carrying safety posters, which are changed each week, on the sides of all tractors.

Foreman in charge of telautograph substation gets move order, sends tractor or truck, whichever is required, on its way to the calling department



At the Bulova School of Watchmaking handicapped veterans outshine other workers in jobs for which they are fitted

WHAT'S HAPPENING TO VETERANS IN TYPICAL PLANTS

PETER FRENCH • ASSISTANT EDITOR, *FACTORY*

Industry is absorbing 80 percent or more of its returning servicemen almost as fast as they come off the line at separation centers. And, in most areas, industry wants more veterans. All this, based on a survey made by FACTORY, is contrary to the predictions of the doleful on V-J Day.

The veteran is fast shaping up as the cream of the labor crop. As one personnel man says:

"Compared with the leatherheads we were getting late in '44, it's a new day around here."

Servicemen were the cream of the crop when they left. Now the healthiest class in the nation, with new skills, with plenty of experience in living with and handling men under the toughest conditions, with a new resourcefulness and independence, they're in demand in industry.

Only a few veterans—a fraction of the problem-men cautious civilians expected to come back—have shown psycho-neurotic tendencies. Many companies hiring hundreds fresh out of blues or khaki report no incidents at all. Problems that have cropped up have usually been straightened out by firm handling.

Veterans who never had jobs or who are trying to make new connections in industry are having their troubles, though. To meet its obligations to former employees first, industry had to give them priority on jobs. That, coupled with setbacks in production, made it difficult for veterans without prior industrial experience to find jobs. At spring peak, there were more than 1,500,000 veterans drawing readjustment allowances. One of three persons unemployed was a veteran. However, the Veterans Administration expects 4,000,000 jobs to open this year in industry as housing and durable goods production gets under way. The end

Complementing provisions of the GI Bill of Rights which enable a serviceman to finish his education, job training provisions of the law are designed to enable veterans to train for jobs with the future they might have had if they'd stayed in industry rather than going to the wars

Q: *WHAT EMPLOYERS ARE ELIGIBLE?*

A: Any employer, whether he can train one GI or a thousand

Q: *WHAT'S REQUIRED OF AN EMPLOYER?*

A: To give "on the job" training, the employer must have a definite training program, although it need not include classroom training. Employer must break down the job for which veterans are training in a job analysis, then outline training program to cover each phase. Trainees must be under guidance of an instructor or a capable workman who can give instruction

Q: *WHO STARTS THE PROGRAM?*

A: States must "initiate and approve" any "on the job" training program, but any Veterans Administration office will guide employers to right office for approval of their programs. In the case of handicapped veterans receiving training, VA has full jurisdiction

Q: *WHAT IS THE COMPENSATION?*

A: VA under the law pays veterans the difference, within limits of subsistence payments, between a normal trainee's rate and the minimum rate of the job for which veterans are training. Subsistence is designed only to compensate the veteran for the time he lost in service, to make it possible for him to learn and still to support his family

Q: *WHO SUPERVISES THE PROGRAM?*

A: Originally, states had only supervision. Today, however, VA is checking programs to be sure no employer is taking advantage of the bill to exploit veterans as cheap labor

Q: *WHAT DOES THIS MEAN TO EMPLOYERS?*

A: Once the program is set up, an employer need only keep simple records, report monthly to VA on the progress of his trainees, and be prepared to have state or VA representatives check occasionally to be sure there's no abuse of the program

VA says the veteran's job objective should conform to the abilities and possibilities of the veteran. Setting goal higher than the veteran can reasonably expect to reach merely to obtain full subsistence allowance will not be allowed by the VA. Nor can an employer have an unreasonably large group training for the possible jobs

Q: *DO EMPLOYERS GUARANTEE JOBS?*

A: No, says VA. If, after training is completed, company finds it cannot use all the men trained, it may release some of them. VA and trainer-employer have fulfilled their responsibilities if the man is employable in the field for which he was trained

Q: *HOW DOES IT DIFFER FROM APPRENTICE TRAINING?*

A: Although government-aided apprentice training plans and "on the job" training are similar in many of the benefits to veterans and to industry, the difference is chiefly in control. Apprentice training is largely limited to companies which can set up long-range apprentice training and government supervision is close. "On the job" training is much more flexible, can be instituted with a minimum of red tape

of 1946 may even see a labor shortage in the United States.

Black spot in the situation, according to Gen. Omar Bradley and the Disabled American Veterans, is that only one handicapped veteran in nine who applied to the Veterans Administration could find employment.

Biggest problem for personnel men in rehiring veterans has been the "boy colonel"—the man who left industry after only a few months' experience, perhaps before he'd had a chance to show his ability, and who came back a first-grade non-com, junior officer, or even lieutenant colonel.

BIGELOW-SANFORD

Recognizing the ability shown by veterans, the Bigelow-Sanford Carpet Company, which has plants in Thompsonville, Conn., and Amsterdam, N. Y., places a high percentage of them in jobs with bigger responsibilities than the jobs they left. Because its total employment fell during war years, B-S is hiring its former servicemen as fast as they return and is recruiting others.

GENERAL FOODS

With interdepartmental and plant-to-plant shuffling, General Foods Corporation has gone beyond the letter of the law in recognizing service-gained experience. In the company's New York headquarters, only 4 of 85 veterans went back to the same jobs with the same status. The company, too, avoided any suggestion of treating veterans as a special class. Personnel men and supervisors in 150 fisheries, canning plants, processing stations, and sales offices have given servicemen special consideration in satisfying their needs for jobs to fit their abilities.

General Foods, however, did not set up special counselors for even its handicapped veterans. GF personnel men have been heartened by the way veterans attacked their jobs, although the company is one of the few in FACTORY's study which noted a significant trend of rehired veterans to drift away, sometimes into their own businesses, after a few weeks' work.

SYLVANIA ELECTRIC

After absorbing easily 630 of the 2300 who left it for military service, Sylvania Electric Products Company, with more than 20 plants, began to "feel the pinch." Sylvania saw its employment multiply during the war, then fall early in the reconversion period. Today it anticipates increasing trouble in rehiring servicemen, is considering "on the job" training to help in putting all its servicemen on the payroll.

"On the job" training, in which the VA subsidizes veterans learning a trade or skill in much the same way it helps veterans complete their education, will

help many industries meet their obligations to veterans. In New York State alone, the department of labor, which initiates and approves programs, hopes to have 200,000 in training before the end of 1946.

NEW DEPARTURE

The veterans' thirst for technical training is very evident at New Departure Division of General Motors Corporation in Bristol, Conn. ND's apprentice program filled rapidly and not a man dropped out. Other veterans eager to be machinists and toolmakers were steered to Connecticut's state educational plans and to night schools.

AMERICAN HOME PRODUCTS

Service experience benefited most men returning to American Home Products Company, whose 1500 veterans are returning to more than 50 plants distributed between California and New Jersey. Fitting them into jobs with earning power and responsibility comparable to their service-developed capacity has reflected a level of morale that has delighted management.

THE TEXAS COMPANY

With more than 6000 employees who entered military service, The Texas Company, whose facilities dot every corner of the United States, reports that 92 percent of those who have been discharged from the armed forces have returned to company service. Texaco has also hired more than 2600 veterans who are not former employees—and it hopes to have more. To aid its servicemen, Texaco thoroughly surveyed its organization seeking jobs for handicapped veterans—but so far comparatively few of those who have returned have been disabled. The company has also extended military leaves into educational leaves for more than 150 veterans so they could take advantage of educational benefits of the GI Bill of Rights. To be sure that none of them will be pressed financially, the company offers them interest-free loans to supplement GI allowances.

EASTERN AIRLINES

One of the biggest "on the job" training programs approved by the VA is that of Eastern Air Lines. Eastern, which has hired more than 2500 veterans in the last year, has more than 500 of them in its regular training programs, approved as "on the job" training by the VA and the 22 states in which EAL operates.

VICTOR ADDING MACHINE

No veteran is considered fixed permanently in his job at the Victor Adding Machine Company, Chicago. Typical of many small firms in the thoroughness of its planning to reorient its veterans, Victor has gone far beyond the letter of the law in meeting its obligation. The company has also taken the job to hospitalized veterans, bringing work and tools to bed-ridden veterans in a Chicago hospital.

U. S. STEEL

Subsidiaries of the United States Steel Corporation, which had hired approximately 33,700 former veteran-employees and more than 27,000 veterans who were not former employees by April 1, have found attitudes of returning veterans very good. Every veteran of these 60,000 had personal attention to help him orient himself on the job. Carnegie-Illinois Steel Company, which, like many major companies, had made extensive surveys soon after V-E Day to help fit its handicapped veterans into the best jobs for them, has hired 571.

Some companies have made unusual efforts to recruit handicapped men, feeling they could easily handle some types of jobs and that they would develop more than the usual loyalty. One major airline was disappointed in recruiting disabled men, finding that a majority of those interviewed, although they could handle the work, were not yet readjusted tempermentally, not yet ready to buckle down to steady jobs.

BULOVA WATCH

Bulova Watch Company, on the other hand, which is training more than 100 watchmakers at the Bulova School of Watchmaking, Woodside, Long Island, has found handicapped veterans unusually good students. In fact the company has expanded the school, installing the plan at three service and VA hospitals. Biggest handicap here was not the veteran or the job, but housing—as many veterans find it. The problem was solved through community cooperation. Woodside found it had many a room or apartment that could be made available to the veterans.

HE'S AN ASSET, NOT A PROBLEM, SAY PERSONNEL MEN OF THE RETURNING VETERAN

IRON FIREMAN MANUFACTURING CO.

EQUIPMENT MAINTENANCE RECORD

MACHINE: Milling		PROPERTY NO.: 3099	
MFG. SERIAL NO.: 1854-S-7-3756		DEPT. NO.: 15	
MAKE: K & T	MODEL: Plain	DATE INSTALLED: 1-17-45	EXP. ORD. NO.: 8216

SPECIFICATIONS: Table travel 60" — Table dimension 18¼" x 70"

Spindle taper #50 — Floor space required 6'-0" x 12'-0"

MAKE OF MOTOR	MODEL	H.P.	R.P.M.	PHASE	VOLTS	CYCLE	AMPS.	FRAME
W.	41442	7.5	1735	3	220/440	60	22	284

DATE	MAINTENANCE EXPENDITURES	LABOR HRS.	LABOR AMOUNT	MATERIAL COST	TOTAL COST
7/45	Change Oil	1	1.50	1.80	3.30
8/45	V-Belt	1/2	.75	1.26	2.01
8/45	Replace fuse	1/4	.40	.05	.45
	Clean motor	2-1/2	3.75		3.75
	·bor bushing	1	1.50	2.15	3.65

Only two basic steps are required in this quick and easy system of maintenance records: (1) A metal plate (left) with identifying number is attached to each machine; (2) all maintenance information is recorded on sheets kept in numerical order in a loose-leaf book

MACHINE UPKEEP HISTORY ON A SINGLE FORM

JOHN BURCHFIELD • MAINTENANCE ENGINEER, IRON FIREMAN MANUFACTURING COMPANY, CLEVELAND

To aid management in deciding when to replace equipment. To increase effectiveness of maintenance. That is the double-barreled purpose of a one-page maintenance record that has been developed for each machine at Iron Fireman Manufacturing Company.

A company property number on a brass nameplate is attached to each machine when it is installed. This property number remains the same throughout the life of the machine, regardless of where the equipment is used. At the same time, the number, with other information important to maintenance, is recorded on an equipment maintenance record sheet. The sheet is then put in numerical order in a loose-leaf book. All maintenance needed by the machine is entered on the record sheet.

The record book gives a complete description of all equipment in the plant. It enables the maintenance engineer to analyze expenditures for upkeep and repair. With the analysis, he can help top management in making decisions as to the disposition of equipment. Repetitive entries showing that the same type of maintenance is necessary on the same equipment indicate that corrective action must be taken. Finally, the record simplifies clerical work and results in speedier repairs.

SAFETY IN HANDLING MAGNESIUM

NORMAN J. THOMPSON • DIRECTOR, FACTORY MUTUAL LABORATORIES, BOSTON

With more and more plants finding new applications for magnesium, this article supplying the know-how needed to handle it safely is especially timely

The ease with which magnesium ignites depends on its form. As a dust cloud or in ribbon form, it can be ignited almost instantly. Loose machine turnings ignite fairly readily. It is less easy to ignite the surface of a compact pile of chips.

Heavy magnesium castings are somewhat difficult to ignite. Sometimes an attempt is made to prove that magnesium in this form is safe by showing that a blowtorch will not ignite it. If the metal does not ignite, it is because the flame application is localized and the metal has such high conductivity that the heat is carried away and dissipated before the burning point is reached. If the whole casting is surrounded by fire, even at a temperature well below the blowtorch flame, it will ignite after a period of time, depending on the exposure temperature and the mass and surface area of the casting. Once well started, a fire in castings is almost sure to consume all the magnesium in the particular pile involved.

DO NOT USE WATER

Ordinary extinguishing agents are ineffective on burning magnesium. Water actually accelerates the burning, because there is so much more oxygen available in a given volume of water than in the same volume of air. The water is broken down by the high temperature into oxygen in which the magnesium burns with great avidity, and into hydrogen which burns to water again in the air of the surrounding atmosphere. This is also the reason that wet magnesium chips burn more intensely than dry chips. Foam is without extinguishing value because it consists principally of water. Carbon tetrachloride, like water, is decomposed and greatly accelerates the burning rate, the principal heat-producing reaction taking place between magnesium and chlorine. Carbon dioxide is also decomposed but does not seem to have any pronounced effect, either to retard or to accelerate the combustion.

During the war, many types of dry, inert powdered or granular materials were tested on fires in magnesium chips and turnings. Several proprietary compounds were developed which proved to be successful in extinguishing such fires. Among the other materials sometimes used were clean iron filings and sawdust-talc mixtures. They are not positive extinguishers but do blanket small fires sufficiently so that well-trained employees can handle the burning chips and carry them outdoors.

NO COOLING EFFECT

Hydrogen, argon, and helium all could be used effectively as fire extinguishers since none of them reacts with magnesium, but they are rarely practical because they must be stored at high pressures and have little or no cooling effect. The use of hydrogen is generally impractical and highly dangerous because of its flammability. Sulphur dioxide combines with magnesium at a somewhat higher temperature than air, but once this higher temperature is reached, combustion in sulphur dioxide proceeds at a slightly more rapid rate than in air.

Hydrocarbon gases and vapors may be used to extinguish burning magnesium, since they are non-reactive and can be applied so as to exclude air. They have limited use, mostly for heat-treating furnace protection, because of their own flammability and the lack of cooling effect. Tars or even soft coal might be used similarly.

There has been some misconception in regard to the effectiveness of nitrogen as an extinguishing agent. In the case of most combustible materials, as soon as the oxygen in the air is sufficiently depleted the fire goes out. However, magnesium once hot enough to burn in air, will react with nitrogen after the oxygen has been consumed. The reaction proceeds at a much reduced rate as compared to combustion in air but evolves sufficient heat to keep the residual magnesium and magnesium nitride at a temperature high enough so that vigorous burning is reestablished as soon as a fresh air supply becomes available.

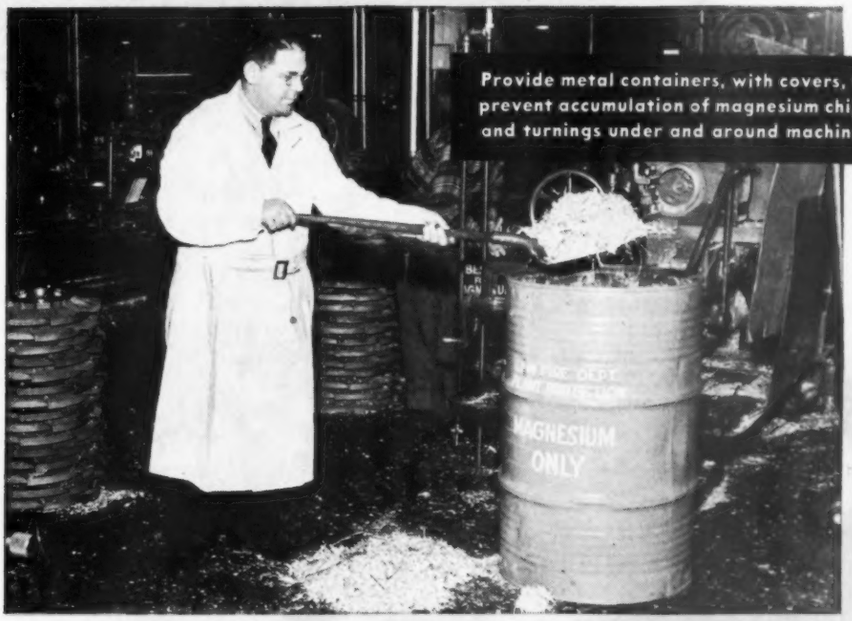
COVER MOLTEN METAL

Some of the more severe hazards in magnesium manufacture are in the production of magnesium castings and other shapes, as at foundries, smelters, and die-casting plants. Here magnesium is handled in its molten state. Exposure to air would cause the molten metal to be rapidly consumed. To prevent this, it is kept covered with flux or an atmosphere of sulphur dioxide. To lessen the chance of metal escaping, steel pots are used instead of cast iron, and pots are tested frequently for weak points. Large pits are provided under the pots to catch the metal if it should escape, and great care is taken to keep the pits dry at all times.

Control of the fire hazard in machining operations is not difficult. Keep the tools sharp and take moderately heavy cuts to reduce friction, overheating, and to prevent ignition. Avoid the use of water in cutting oils, because of the greater combustibility if chips are wet; coolants such as mineral seal oil or lard oil are safer. Do not let chips and turnings accumulate on, under, and around machines. Provide covered metal containers near each machine into which the scrap can be put.

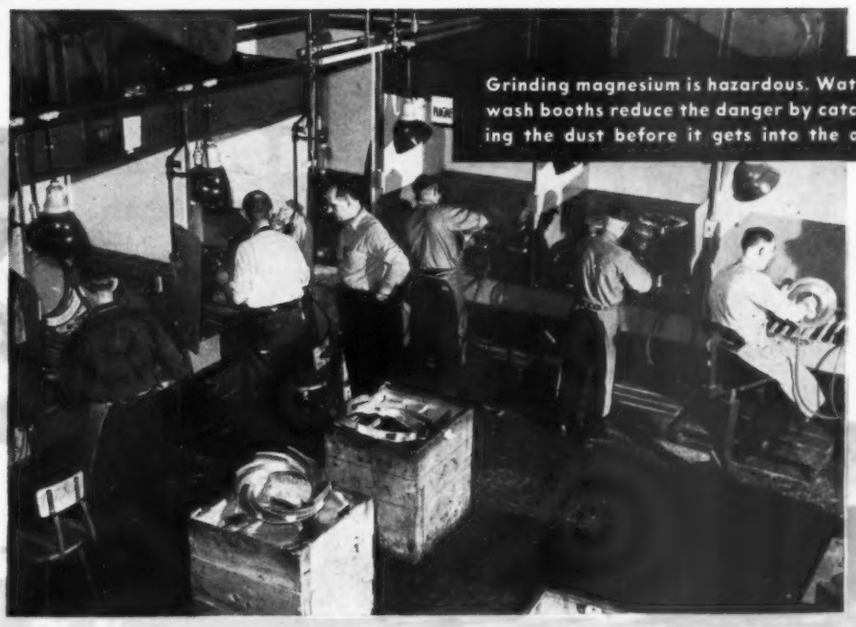
If a fire occurs in magnesium chips in a machine shop, a procedure that has proved effective is to cover the burning chips with extinguishing powder, shovel the mixture into a drum, and haul the drum outdoors.

Remove containers for chips and



Provide metal containers, with covers, to prevent accumulation of magnesium chips and turnings under and around machines

In machining magnesium, avoid the use of water in cutting oils. Coolants such as mineral seal oil or lard oil are safer



Grinding magnesium is hazardous. Water wash booths reduce the danger by catching the dust before it gets into the air

turnings as soon as they are full or before closing the plant at night. The covered cans can be put in a noncombustible building in the yard, or in a wooden building equipped with automatic sprinklers if the containers are watertight; but in either case send the scrap to the reclaiming plant as frequently as practical.

Clear scrap castings of chips and turnings, and store them in a structure well detached from main buildings. This structure should not be used for storage of other combustible materials. Do not allow the scrap accumulation to exceed one carload before shipment to the smelter.

FOR SAFE STORAGE, ARRANGE MAGNESIUM CASTINGS IN SEPARATE SMALL PILES

The dust produced in the grinding of magnesium castings is extremely hazardous—more so than any other form. Six men died in a recent grinding room fire and explosion, following ignition of magnesium dust in an exhaust system. The important thing is to separate the magnesium dust from the air. This requires a specially designed collector, several types of which are commercially available. The dust is caught with a water spray or oil spray as soon as it is formed, and settles out in the form of a sludge. The wet or oily sludge is hazardous after it is removed and becomes partly dried. Mix it with sand and bury it, or burn it at a safe distance from buildings.

In operating furnaces for treating magnesium, take special care to prevent overheating. Even a slight amount of overheating can cause trouble. The critical temperature depends upon the alloy, the lowest being about 750 deg. F. Temperature controls, automatic shutoffs, and furnace design to avoid localized hot-spots, are important. With some alloys, a special atmosphere of sulphur dioxide is necessary to prevent oxidation of low-melting constitutents.

A series of tests recently conducted by the Factory Mutual Laboratories has sought conclusive answers as to the best protection for magnesium castings, whether piled in storage areas or stacked in smaller piles in machine shops. A fire in the vicinity would soon involve such castings.

Tests made thus far, involving fires in quantities of castings as high as 2000 pounds, show that automatic sprinklers are needed over such piles or bins of castings if the building has any combustible construction or contains any combustible material. Omitting sprinklers would risk loss of the building. Sprinklers speed the burning of the magnesium and apparently make the fire more severe, but the water discharge keeps the room atmosphere relatively cool, protects the building, and prevents ignition of surroundings except within a distance of a few feet.

FIREMEN ENDANGERED

Equivalent protection cannot be obtained from hose streams. Smoke and heat spread through the room and make it difficult for firefighters to get within effective striking distance. Water applied from hose streams also causes violent reactions, which scatter burning magnesium, and endanger the hose crews.

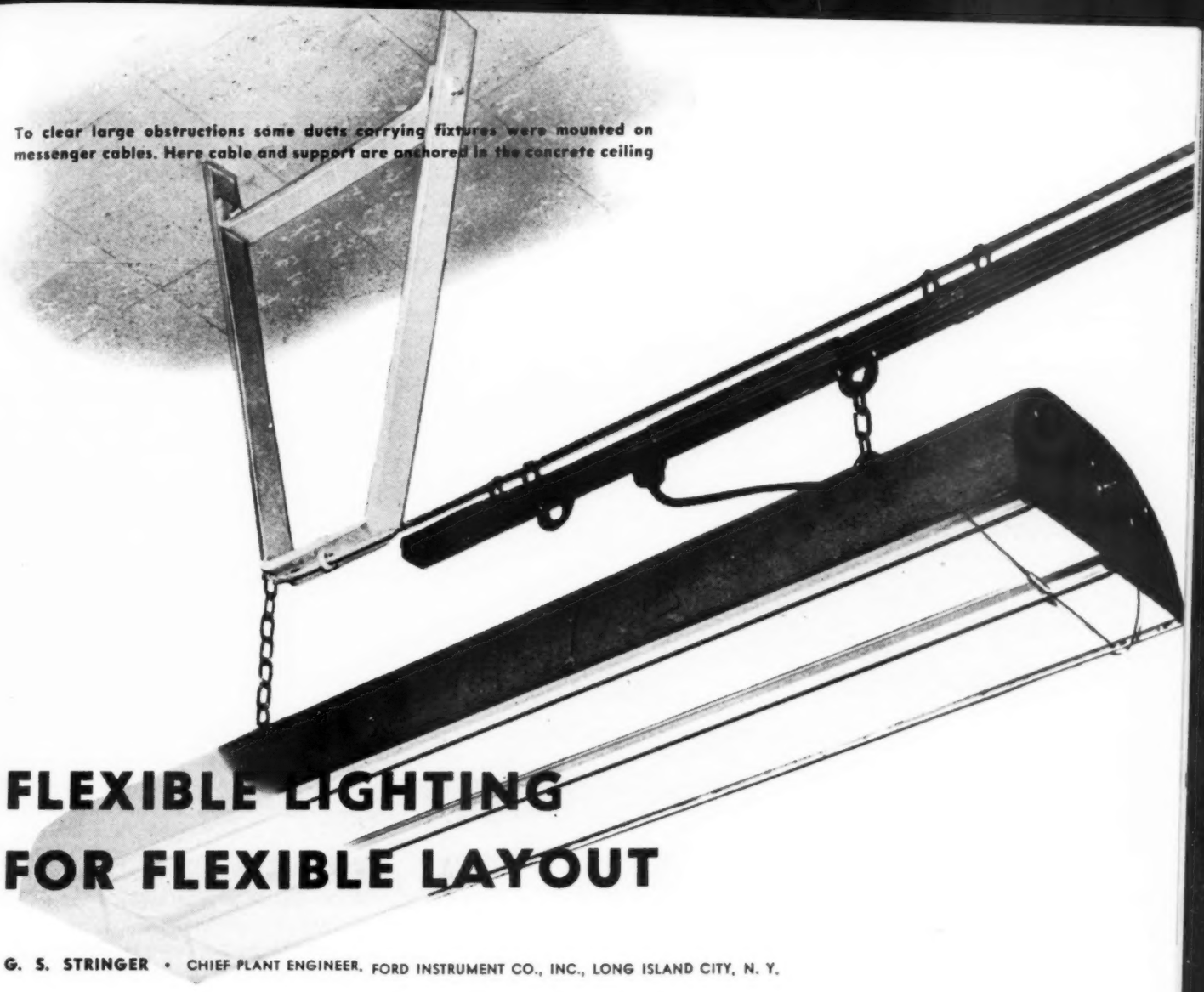
There is considerable danger of serious building damage from explosions in fires involving large quantities of magnesium when water is used for protection, whether from hose streams or sprinklers. The violence of such explosions appears to be increased when storage is on concrete floors. Preliminary tests show considerable merit in reducing the violence of explosions as well as the burning rate when the stored castings are located over not less than 10 inches of sand or cinders covered with a convenient trucking surface such as 2-in. plank. In the event of fire, in order to eliminate or reduce possible explosion damage, open all windows, doors, and roof hatches as soon as practical, to allow the maximum pressure venting and to eliminate potential accumulations of unburned hydrogen.

BURNS THROUGH FLOORS

Never store magnesium castings over a basement or subgrade space. A fire involving several hundred pounds of magnesium will easily burn through a wood floor and will probably disintegrate a 6-in. concrete floor, allowing burning metal to spill through into the space and come into contact with water from sprinklers or hose streams. The burning magnesium in such a confined location can quickly reduce the oxygen content of the air, after which hydrogen will accumulate. Subsequently, when fresh air enters, a hydrogen explosion may occur of sufficient violence to destroy the entire building.

Castings stored in non-combustible warehouses do not require automatic sprinklers, provided there is nothing else combustible in the building and piles are well separated. It is best to limit storage in any one area to 25 tons, if the storage building is of combustible construction and not detached. If the building is non-combustible or detached, the storage limit should be 50 tons. In any event it is advisable to subdivide the storage into several piles of not over 5 tons each, with aisles at least 6 feet wide.

Summarizing, the most hazardous operation is grinding, which requires special separators to remove the dust. Molten magnesium is also hazardous, moisture must be kept away, and pots must be checked periodically. In machining operations, magnesium is not as combustible as many other materials handled in industrial plants but it does require special training of employees and the observance of special safeguards. Good housekeeping and prevention of congestion are of primary importance.



To clear large obstructions some ducts carrying fixtures were mounted on messenger cables. Here cable and support are anchored in the concrete ceiling

FLEXIBLE LIGHTING FOR FLEXIBLE LAYOUT

G. S. STRINGER • CHIEF PLANT ENGINEER, FORD INSTRUMENT CO., INC., LONG ISLAND CITY, N. Y.

When a new lighting system was installed in the plants operated by Ford Instrument Company, Inc., one of the important requirements was that it be made as flexible as possible, from the standpoint of providing light wherever needed. This need for flexibility came about because of the frequent and radical changes in the location of machine tools, inspection benches, and other workplaces.

It was decided to use fluorescent lamps practically exclusively. Also to suspend the fixtures from small ducts containing two copper conductors and fitted with sliding contacts or trolleys, to secure the desired flexibility in locating the lights wherever needed. With this arrangement any fixture can be slid backward or forward in a moment. It can be swung around, also, at any desired angle to the duct.

The lighting system that was replaced consisted of 200- to 500-watt filament lamps in fixtures that were permanently mounted in the usual manner. When a change in layout made it necessary to move lighting fixtures, considerable time and labor were required to alter the conduit lines and relocate the units.

The following description applies primarily to the installation in the main plant, although the lighting installations in the other plants are substantially the same.

Most bays in this plant are 20 feet wide. Three rows of ducts were installed in each bay. The length of the duct runs varies from 10 to approximately 200 feet. To limit the load on the circuits feeding the lighting system, long runs of duct are broken up into sections by spacers placed between the ends of adjoining ducts. These spacers insulate the conductors in one length of duct from those in the other, but do not interfere with movement of the trolleys between ducts. Each section of ducts is then supplied from a different circuit.

In the office about 85 percent of the electrically operated business machines are powered from the ducts that supply the lighting fixtures. The remaining 15 percent of machines get their power from separate runs of ducts. In this way the need for installing new outlets, or relocating the old ones, is avoided.

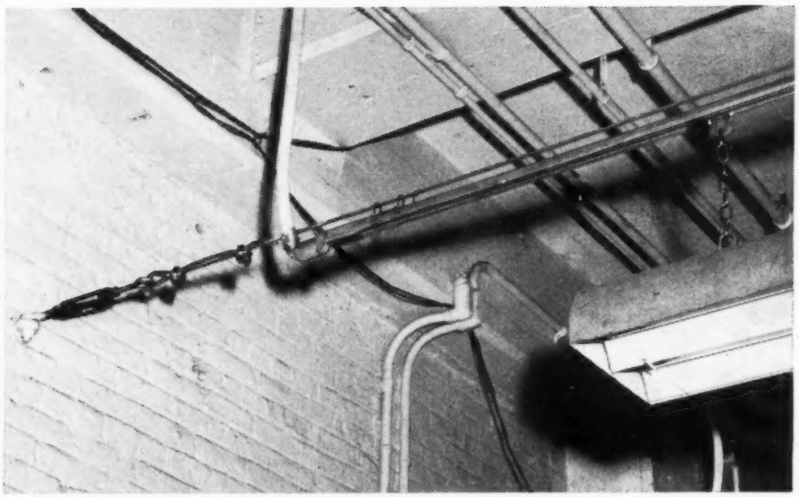
Several methods of suspending the ducts were employed, the choice depending largely on local conditions. In a few instances the duct is supported on a messenger cable which in turn is stretched between eyebolts or simple brackets and supported at intervals by strap-iron hangers. This method of installation was used, for example, where the presence of numerous large overhead obstructions would have made other methods of mounting too costly or cumbersome. The tendency of the messenger cable to sag unless it is

securely anchored is the chief drawback of this method of mounting.

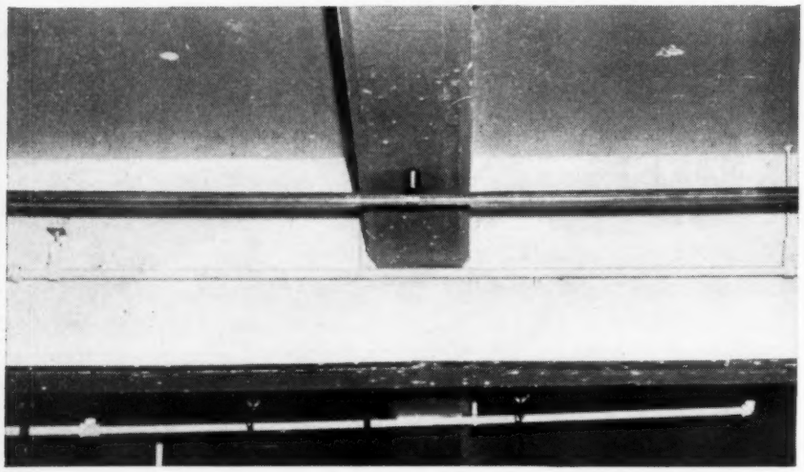
Wherever possible the duct was mounted directly on the ceiling. That could be done, of course, when there were no projections or obstructions in the length of run necessary.

If the obstructions were small, such as minor conduit lines or sprinkler pipes, use was made of pipe spacers ranging from 2 to about 4 inches long. These spacers were made from scrap 1-in. conduit.

When it was necessary to clear larger obstructions, so that the ducts had to be dropped still farther from the ceiling, a hanger formed by bending a piece of ¼x1-in. iron at a right angle at each end was employed. Such hangers were made in lengths up to about 18 inches.



Sometimes messenger cables are supported by an eyebolt, and drawn tight by a turn buckle. This view also shows the method of connecting the duct to the lighting circuit



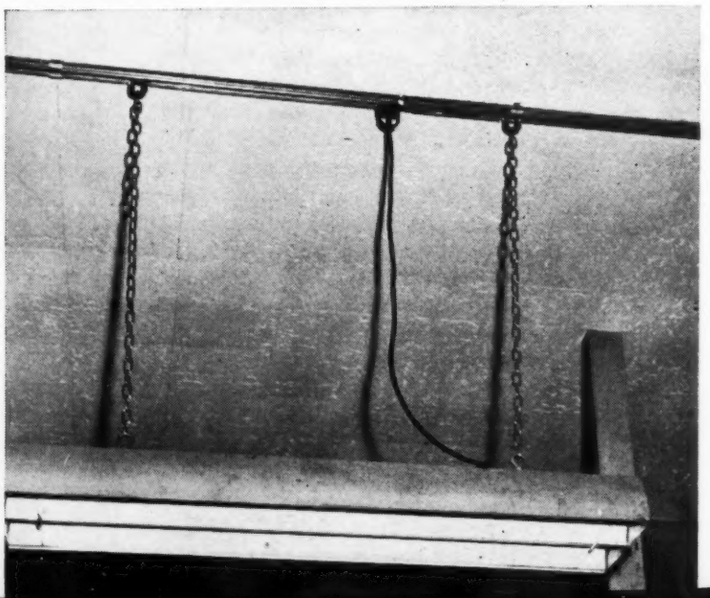
Spacers were used when only small obstructions had to be cleared. Spacers, made from scrap 1-in. conduit, are from 2 to about 4 inches long

This type of hanger was often used in conjunction with V-shaped brackets made of ¼x2x2-in. angle iron, which are very strong and rigid. These brackets were used in lengths up to about 3 feet.

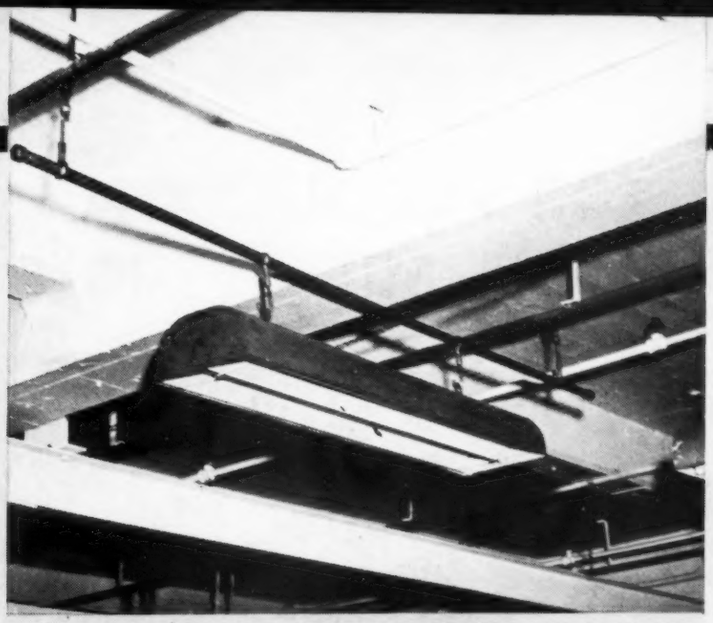
There are a good many instances where a fixture should be swung around at some angle, say, between 45 and 90 degrees to the duct, in order to give the best results. The answer to this problem is simple. Suitable lengths of lightweight steel pipe are suspended crosswise from two adjoining and parallel runs of duct, and the lighting fixtures are in turn suspended from the pipes. In this way fixtures can be placed exactly where required.

The fixtures have two 40-watt fluo-

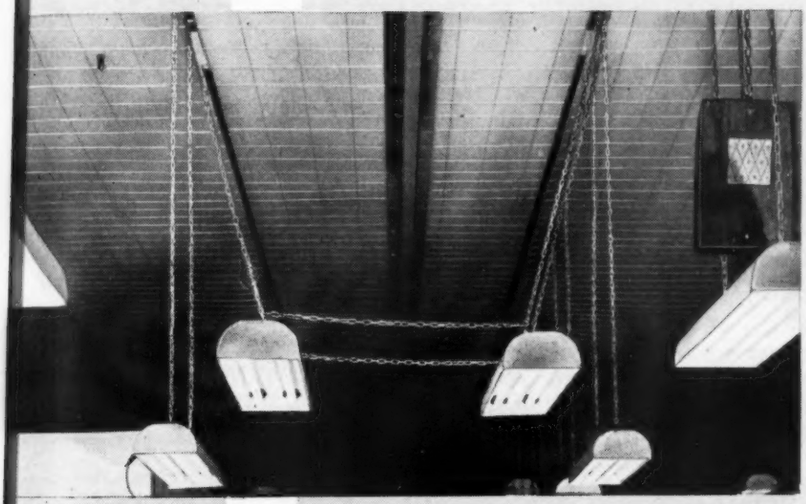
When there were no obstructions, duct was mounted directly on the ceiling, in this case on acoustic tile. This view was taken in office area



It takes only a moment to shift these lights around



In some places, duct was mounted on beams, and supported on hangers made by bending ¼x1-in. strap iron at a right angle at each end

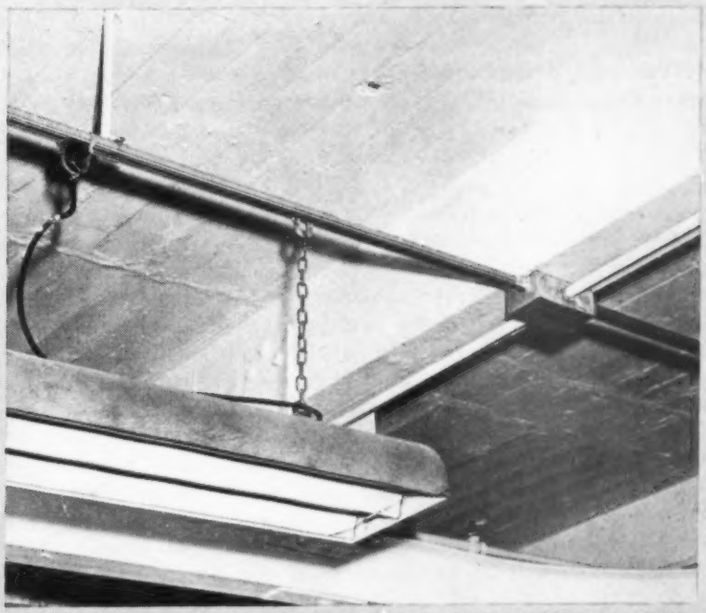


Chain suspension of the fixtures makes it easy to increase the light at any spot by swinging two of them out of line and tying them together

Changes in plant layout mean changes in lighting

rescent tubes each, as will be seen from the illustrations. They are suspended on chains. Depending on location and requirements, the mounting heights vary from about 3 feet (over inspection and special work benches) to 12 feet above the floor. The average intensity of illumination is 25 to 30 foot-candles in office areas and 45 to 55 for machining operations, while intensities of 75 to 100 foot-candles are provided for special jobs.

Most of the fixtures are controlled from the lighting panels. The remainder, about 15 percent, have individual switches.



Fixtures are located at an angle to the duct by hanging lightweight steel pipe from two rows of duct and suspending them from it

BONUSES FOR PRODUCTION, MAINTENANCE, SUPERVISION

W. E. BLEWETT, JR. • PRODUCTION MANAGER, NEWPORT NEWS SHIPBUILDING & DRY DOCK CO., NEWPORT NEWS, VA.

Paying wages and salaries on the basis of production is fundamental in the Newport News Shipbuilding & Dry Dock Company. About 85 percent of the personnel now earn all or part of their compensation under some kind of bonus, premium, piecework, or lump-sum job system.

The system is highly complicated. It spreads over an almost self-sufficient, single-plant shipyard, where ships are both built and repaired and heavy hydro-electric plant equipment is made.

In a plant like this it would hardly be possible to lay out a complete incentive system beforehand. It could take form only by evolution. There is only a limited amount of repetitive work. Every ship is different. Most of the work is new, in shapes, fastenings, metals, size. It is not easily reduced to standardization. Therefore, it is not easily reduced to a basis of pay according to production.

Consequently, it has taken time to cover the plant. No one plan is workable in all departments. Many plans and variations of methods have been devised, and revised, to suit differing conditions.

Three kinds of employees are covered —production men, service employees, and supervisors.

PRODUCTION EMPLOYEES

This classification is the one most commonly brought under incentive systems, because earnings of production employees are directly related to output. Contrary to the usual plan, it is impossible in this plant to set up a system rising from a base wage. This is because, aside from piecework—which is called counted work—there are few jobs of the same kind to serve as precedents for production costs.

The foundation of the system for production workers is a time-study department that estimates the production price of each job. The men in this time-study group are the best craftsmen found in the production departments, carefully trained in estimating prices. A man's ability as a welder contributes more than any other asset he may have in fitting him to evaluate welding jobs accurately. His knowledge of his trade is far more valuable than merely knowing how to set up an estimate on paper.

A notable confidence has been generated among the crew men by their knowledge that the estimates are not made by clerks, or by men thinking only of company profits, but by men drawn largely from among themselves, and with working knowledge of the jobs. All sides agree that the practical judgment of the time-study department is worth more than all its facts.

The size of the jobs is kept down to what can be done by one man or a gang—a small crew of men, working under a quarterman. If the gang does the job for less than the estimated price, the men participate in the savings. If the cost exceeds the estimate, they receive only their day wage.

Unless all things are in order for the work, and unless all persons concerned assume responsibility for getting the job done, the gang of workmen will not be able to do it in less than the estimated time, and at less than the estimated production price. They will not be able to earn a bonus.

At Newport News Shipbuilding this danger is forestalled. When the estimate is released, it carries the signature of the time-study department at the right-hand, bottom corner. The estimate goes to the foreman, who looks it over and checks carefully enough to satisfy himself that it is right, after which he signs it, thereby pledging himself to organize so that the gang can do the job. Then it goes to the supervisor, whose business it is to see that everything is put in readiness, and his signature attests his acceptance of responsibility. Next, after all the materials and tools have been ordered, the quarterman signs. And last, the man who is to perform the work, or one of the gang, signs to accept the tools, materials, and working conditions.

Here are the elements that make the plan work:

First, a crew of men working together for a bonus become expert, not only in individual skills, but in coordination of their efforts. They become more expert in the economy of effort than can be approached in any other scheme of work. A team spirit is evolved that exceeds anything that can be realized in any other system. They police one another. They help one another. They work together as an animated machine complete within itself.

Second, no plan is better than the policing it receives in practice. The crew checks the estimate itself, and also the performance of the supervisors in preparing for the job. Since the rule is that vacancies are filled from the bottom, most of the men who have any part in organizing and supervising the job have worked in gangs themselves, and have earned bonus money by doing jobs at less than estimated prices. So the crew men can check where they will without restraint, and they can carry their complaints right up to the top management.

Suppose, for instance, that all the parts for doing a job are piled up on the floor, but that the area in which the job is to be done is still occupied by wrought-iron pipe which should have been removed. Or suppose the portable drill needed for the first operation has not arrived. The gang is there, ready to go to work. Who is to blame?

No loud talk, no profanity, no abuse, and no clashes are tolerated at the com-

pany. A breakdown in efficiency is not an occasion for a violent exchange of criticism. The situation is smoothed out, with proper censure for whoever is to blame for the slip-up, and with adjustment for the crew.

The effectiveness of the plan is in these two principles: Solid teamwork of the crew, and formal acceptance by all supervisors for responsibility in preparation for the job—both subject to vigorous policing.

Such a plan works in curious ways sometimes. The estimating is so close that not much liberty can be taken with the arrangements without raising the cost. A foreman may be short of helpers, and put in another mechanic to get a job done. But that mechanic's wage, in the base of the estimate, can raise the price so much that the crew cannot make its expected bonus. Who complains? Not the company, for it is getting the job done at the estimated price. The gang complains, because it is unable to finish the job below the estimated price, and cannot make bonus.

Also, since the foremen and supervisors make their bonus on the basis of production of their crews, they take no estimated price for granted, and may decline to accept one. Or they make suggestions for improving estimates.

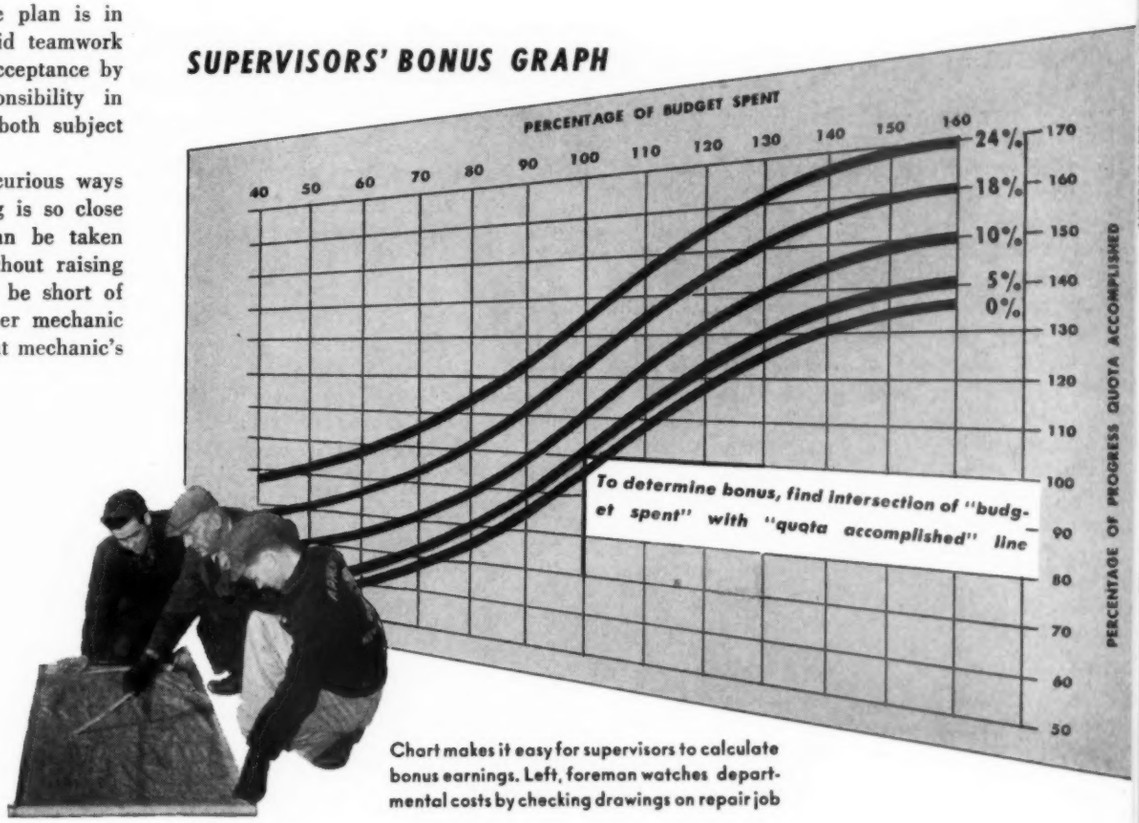

SUPERVISORS' BONUS GRAPH
PERCENTAGE OF BUDGET SPENT
40 50 60 70 80 90 100 110 120 130 140 150 160
24%
18%
10%
5%
0%
170 160 150 140 130 120 110 100 90 80 70 60 50
PERCENTAGE OF PROGRESS QUOTA ACCOMPLISHED
To determine bonus, find intersection of "budget spent" with "quota accomplished" line

Chart makes it easy for supervisors to calculate bonus earnings. Left, foreman watches departmental costs by checking drawings on repair job

SERVICE EMPLOYEES

The plan for general and service employees is based on units most adaptable to individual departments, and additional pay is arranged for such employees on the basis of efficiency. There are many departmental divisions or units, and the basis of the unit plans varies with the kind of work done. Typical entries in the schedule are: Dry docks, tonnage of vessels in and out; tabulating department, number of cards punched; rivet group, number of rivets driven; lumber handled.

Each of these units has an individual plan worked out in detail, based on the peculiarities of the unit. Scrupulous attention is given every item. For example, the lumber yard, which is a service department, receives, stores, kiln-dries, and delivers to the other departments. It was found that the fairest basis for this unit is the total footage of lumber received and disbursed during a month.

The foundation for each unit plan is the operating cost from the ledger for a period of 6 to 18 previous months. A standby charge, or cost at a theoretical zero of work, was used for figuring the rate of increase. On each plan, which is typed in formal style, this cost of operating is shown, and the amount of the weekly or monthly budget is stated —making allowances for the number of working days or weeks in the period.

Fifty percent of any saving is paid to employees as extra compensation.

SUPERVISORS

In the organization of the plant there are these grades of supervisors: (1) Superintendents of divisions, (2) foremen, (3) assistant foremen, and (4) quartermen.

The incentive plan for supervisors, including clerical help in operating divisions, is based on finishing a ship, or any other big job, within the budget cost. The objectives are set up for a 3-month period.

For reaching the objective, each supervisor and office employee in the division receives added compensation based on his regular pay. For exceeding the quota, the extra percentage is increased. If the objective is not reached, workers get only their regularly scheduled pay.

To make it easier and quicker to calculate the bonus earnings of the supervisors and the clerical help, a special chart is used (see above). It is made to fit this company's peculiar needs, but the form may be of some value to other firms.

If their crews keep within budget costs for the quarter, the supervisors and clerks make a bonus of 5 percent. That is the point on the chart where the horizontal 100 percent of "Progress Quota" meets the vertical 100 percent of "Budget Spent." For other percentages in either direction the graph is surprisingly accurate. Thus if supervisors spend 120 percent of the budget and realize only 100 percent of the progress quota, they make no bonus. But if they are able to do 140 percent of the progress quota with that overexpenditure of 120 percent they will make a bonus of about 20 percent.

EIGHT STEPS TO A CLEAN SHOP

CHARLES KNOBLAUGH • PLANT SUPERINTENDENT, THE HALLICRAFTERS COMPANY, CHICAGO

Good housekeeping becomes easy when a general clean-up schedule is maintained, when systems of stock control and waste disposal are aimed at tidiness, when cleaning is assigned to the department that can handle it most efficiently. This has been the experience of the Hallicrafters Company, Chicago. This firm emphasizes the principle that dirt-prevention is a practical way to keep a shop clean.

Eight basic steps contribute to the effectiveness of the housekeeping system at the Hallicrafters plant. They are given here with illustrations of how they work.

CLEAN-UPS

The factory area—200,000 square feet of floor space—is thoroughly cleaned from 4 to 5 p.m. At 7.30 each morning the office area is cleaned. On Saturdays, a still more thorough general scrub-up is given all areas.

To prevent loitering that is common with cleaners who wait for the place to become dirty or littered before going to work, the crew of eleven janitors is merged with the materials handling department. At three scheduled periods during the day—from 9.30 to 10.10, from 12.45 to 1.30, and from 2.10 to 2.50—the factory area is given a quick going over. The rest of the time, except in emergencies, janitors work with the supply section. They move material and completed units through the factory.

PERSONAL LOCKERS

The Problem of disorder on production lines, which is so often caused by personal belongings, lunches, and women's purses scattered around on the workplace, has been eliminated by the installation of a personal locker at each of the work stations. Wooden drawers, equipped with locks, were built in the unused space between the legs of benches. Production tools are stored in the lockers at night.

NEAT LUNCHROOMS

For cleanliness, and to do away with dishwashing, paper plates and cups and wooden forks and spoons exclusively are used in the lunchroom. Each employee becomes his own busboy. When he finishes his lunch, he disposes of refuse in containers conveniently placed at all exits. These containers are removed after the lunch hour and rest periods.

INSPECTION

The plant superintendent inspects the factory for good housekeeping at irregular, unscheduled periods. Department heads are instantly informed when anything is out of order. Inspections are emphasized and accepted as a necessary plant function.

BIN STOCK

To keep the stockroom in an orderly condition, all loose stock is packaged. After material has been checked at the incoming inspection stations, all paper and other extraneous material is removed, and parts are boxed in the quantities that are used for one production run. For storage in the stockroom, all boxes of parts are labeled and are then stacked according to item or part number. No open bins are used, even for small parts.

STOCK DELIVERIES

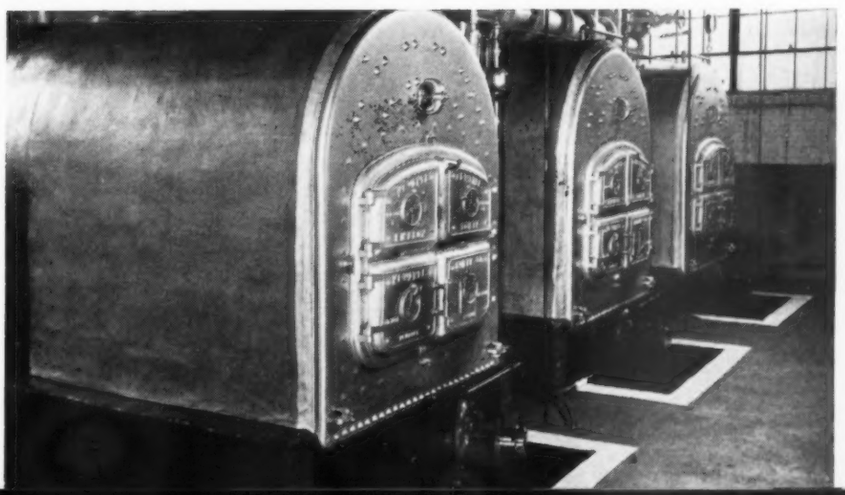
Parts for assembly are delivered to production lines free from paper, boxes, or any foreign matter. Metal bins, which fit into jigs within easy reach of the operator, are used to deliver parts to line positions. Orderly delivery in the right amounts prevents scattering of material, helps to keep shop neat.

WORKPLACES

Every afternoon, at 4.28, a bell rings, signaling a 2-min. clean-up period for all employees. It is the responsibility of every worker to keep his surroundings spotless. The employee who is not naturally tidy stands out like a sore thumb, and soon learns to mend his—or her—ways.

BOILER ROOM

Constant care keeps the boiler room spotless. Grime and dust are non-existent. Part of the night attendant's job is to clean all equipment. Painting, with danger areas indicated clearly in red and white, helps make his work easier and also preserves the machinery.



PROJECTION IS STOPPED AT THE CLIMAX OF A CRUCIAL PROBLEM. THEN FOREMEN SUGGEST SOLUTIONS FOR COMPARISON WITH THE PICTURE

MAKING SURE FOREMEN HAVE THE KNOW-HOW

Training that increases foremen know-how is pacing a change-over in production methods at Kalamazoo Stove & Furnace Company, Kalamazoo, Mich.

An intensive 100-hour "shirtsleeves" foreman conference program has recently been completed. Direct results of this "taking-hold" at Kalamazoo are new operational procedures, new cost-cutting production methods, and improved foreman-to-foreman relations.

The foreman training was organized and operated from the inside outward —not from above. Foremen went right to the heart of questions posed by themselves in a series of 50 sessions, over a period of 11 weeks, conducted on company time.

As war contracts drew to a close, Kalamazoo made plans for a complete break with traditional stove manufacturing methods. Designs were developed for a restyled plant, along the lines of automobile mass production. Manufacture was to be geared to the rate of one stove or furnace unit every 20 seconds.

When drawings of the new plant layout and a breakdown of all the operations had been completed, foremen were called in and given copies. They were asked to take the plans home to study and then come back with suggestions. War bonds were given for usable ideas.

Next, foremen were sent anywhere in the country at their own request to study equipment that might be used in their departments. When they came back, they made recommendations toward the choice of machinery.

Thus Kalamazoo tapped the gold mine of experience, ingenuity, and know-how available in the minds of its corps of foremen, half of whom had been building stoves and furnaces in

the company for 10 years, a quarter of them for 20 years.

But this was only part-way conversion. In order to put the stepped-up program into action, it became clear that top management must delegate more authority to foremen. A clarification of responsibilities was needed. The company wanted to give foremen a broader view of the entire company operation so that each would have the background to move into more responsible supervisory positions.

A group of 30 men was chosen for training. Army-style condensed training methods were used. Complete courses in basic economics, company background and departmental functioning, labor legislation, the union contract, instruction of employees, time study and improvement of methods, man-to-man relations, responsibilities, authorities, and safety methods were packed into the 50 sessions.

Techniques developed in the company's sales training experience were applied, as well as methods borrowed from the Training Within Industry program of the War Manpower Commission, and materials furnished by the University of Michigan Department of Vocational Education.

Three types of sessions were used—straight lecture; lecture conference, in which the speaker talks, then throws the meeting open for discussion; and straight conference. The program started with the first and worked up to the third type in the second week.

Had discussions been introduced immediately, before the group was relaxed and ready to participate, the training might have bogged down into a pattern of question and no response.

To keep interest fresh, subjects were alternated. The group did not face the same speaker or conference leader two days in succession, nor was it forced to consider the same subject two days in a row.

Moving pictures and sound-slide films provided variety and presented ideas through vivid and condensed impressions. One technique that proved popular was the halting of a film at the crucial moment depicting a foreman-employee crisis in order to have each member of the group suggest his own solution of the problem. Then the film was started again to complete the dramatized solution for comparison.

After discussions of "the foreman as a leader," each man was given a leadership rating questionnaire to take home. This was one piece of homework that was not to be returned. Each man's curiosity about himself was the motivating force that put across a powerful lesson, when he compared his self-rating with standard answers concealed on an inside flap of the questionnaire.

Special "textbooks" furnished each man were three pocket-sized cards, each with an at-a-glance formula for meeting one of three problems—personal relations, methods, and employee training.

The course was kept flexible at all times so that special interest in a subject could be encouraged to the limit.

For instance, questions about the union contract came so thick and fast and continued so long that this discussion lengthened from the four sessions planned to eight meetings. "They really made me sweat!" confided the union contract specialist who acted as discussion leader.

Cost accounting came to life when department budgets were set up as though the departments were small independent companies. Foremen could better understand the importance of overhead and its relation to production goals and rate of production when these were viewed in terms of an accounting system for Joe Wilson's press room.

PROGRAM OUTLINED

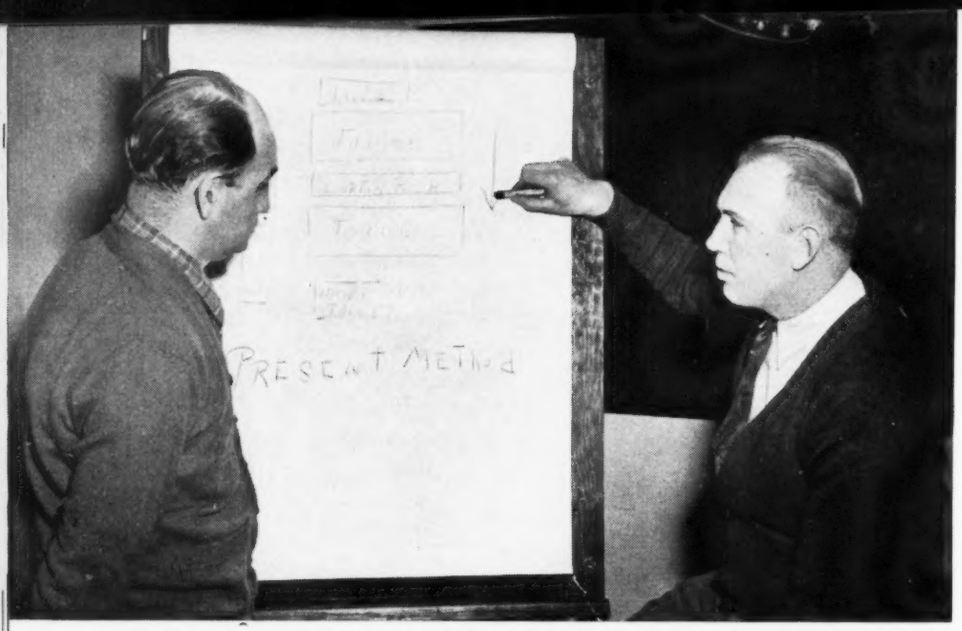
Kick-off for the conference was in a downtown hotel, where the plant manager presented to top management an outline of eight points that foremen had indicated were uppermost in their minds:

1. Knowledge of the union agreement
2. Statement of company rules
3. Comprehensive statement of foremen responsibilities.
4. Authority and backing to carry them out without encountering short-cutting around foremen
5. Direct routes of information
6. Understanding of the other departments of the company
7. New information on employee training and handling
8. Safety and production methods

In response, the president described how each point would be covered in the course, stressed the need for newer, broader thinking by all of management, explained how foremen formed the single channel through which employees could be reached on the job.

The first session continued with descriptions by department heads of the sales department's plans, how adver-

Foreman demonstrates job instruction training by breaking a job down into its simplest parts, stressing key points for quick comprehension, using another foreman from the group as trainee



This foreman analyzes an operation before a methods-study group. Using the excellent chalk-talk method of presentation, he lists and diagrams each step. Meeting is then thrown open and simplifications and improvements are discussed by the group

KALAMAZOO STOVE & FURNACE COMPANY
SKILL CHART FOREMAN F. Taylor

	INSPECTION	DRILLING	TAPPING	GRINDING	POLISHING	ASSEMBLY	PACKING	CRATING	ELECTRICAL WIRING	TESTING	
P. Morton	X	X	X	X	X	X					
H. Holbrook							X			X	
H. Condon	X						X	X		X	
G. Terry						X			X	X	
W. Rogers		X	X	X	X	X					
H. Ball	X	X	X	X		X					
J. Sampson							X	X			
J. Bullock	X	X	X			X			X	X	
T. Thorne	X			X							

A skill inventory sheet, worked out by a foreman for use in his own department, proved valuable for use by all foremen. It aids in making assignments and in keeping replacements trained. (Below) Foremen discuss the union contract—a subject in which all were interested

tising contributes to the company's master plans, cost control and budget planning, purchasing, production control, inspection, the traffic department, product engineering, and product testing.

After the first week's sessions, the training group was divided into three units of ten men each. The seven following courses were handled:

BASIC ECONOMICS. This study was designed to clear up thinking on capital, labor, management, the consumer, and the part each plays in the American economic set-up. To loosen up the group, each foreman took a turn in reading aloud paragraphs from the short, colorful textbook, "How We Live."

LABOR LEGISLATION. Discussion included a clause-by-clause going over of the union contract. Each foreman was given a copy. Close questioning and long discussion disclosed much interest in foremen's rights and responsibilities.

JOB INSTRUCTION. After lectures, demonstrations, and discussion on how to teach a man a new job, each foreman demonstrated before the group by instructing another member in an operation and breaking the job down into its simplest parts, stressing key points for quick comprehension.

METHODS STUDY. Lectures, discussions, and movies on the principles of motion economy preceded "take-home" work in methods. Each man took one job, broke it down into its smallest parts, and listed every detail. Then he analyzed the job in an effort to work out improvements and simplification. He presented his study to the group and threw the meeting open for discussion, criticism, and suggestions.

SAFETY. This subject was described as a selling job for foremen. The state workman's compensation law was explained.

HUMAN RELATIONS. As in the methods study, each man presented the solution to a problem before the group. All facts were listed, all possible solutions considered, and a choice made.

RESPONSIBILITIES AND AUTHORITIES. Culmination of the program was the writing down of company policy and point-by-point discussion of it in the conference meeting. Revisions were made in accordance with suggestions offered.

Mr. INDUSTRIAL MANAGER— HERE'S YOUR CHANCE

"TAKE IT AWAY," says Boss Public, who is fed up with the idea that a few labor leaders can hamstring the entire economy—and is therefore in the mood to let Mr. Industrial Manager show what he can do. This requires, says Whiting Williams, the regular, year-round, top-level raising of two questions

WHITING WILLIAMS • CONSULTING EDITOR, *FACTORY*

Labor mess, labor crisis, civil war, chaos—public confusion, anger, fear. How this dangerous brew can ferment into welcome action was, thanks be, finally demonstrated. At long last, the President told Congress that Boss Labor must bow to Boss Public. By his illogical and unconvincing veto of the Case Bill, he later showed his relapse back into the continuance of his party's long partnership with leftish labor leaders. All the same, the national crisis that gave him a brief moment of courage also gave millions of workers and other citizens more hope than in thirteen long years for that partnership's fairly early ending. In spite, therefore, of a stymied Congress, Boss Public today stands readier than in a long time to give Mr. Industrial Manager a fairer chance to show what he can do.

It is unfortunate that it required so serious a crisis to demonstrate what happens when a few labor leaders hamstring the entire economy in order to gain for their particular organization not mere "union security" but instead complete supremacy over their competitors. Observers close to Whitney's situation employ much the same terms as others use to explain John L. Lewis's long and puzzling refusal to state his demands.

"Lewis's original strategy," so a politico close to Washington developments puts it, "was to keep the workers in steel, motors, electric and radio equipment out of work and thus from reaping any advantage from their strike-won wage raises until they perceived that he's the guy who tells 'em when they can work and when they can't. When—and only when—they finally were willing to forsake their CIO leaders and make peace with him and his AFL, he'd kindly permit 'em to go to work! Thanks to Secretary Krug, he gained much the same objective with Government help."

Disastrous as are such battles of the giants, they are perhaps worth their cost if they finally reveal the tragic joke represented by the Wagner Act's grant of unlimited power without responsibility for its announced purpose of "eliminating the causes of certain substantial obstructions to the free flow of commerce."

Whether we have now seen an end to the long partnership between the party in power and certain unions is still uncertain. Whatever "permanent" laws are finally passed, it looks as though collective bargaining with employers will long be displaced by pressures purely political.

So, while John and Jenny Citizen breathed a little easier as they wired thanks to their President, they are still far from happy. They still fear calamitous inflation. Except for Bowles's unconvincing defense of OPA, they still see no sign of Government's concern with other and far more fundamental brakes. And their fears of Communist infiltration and plotting are even greater than before. Certainly Murray's straddle at Atlantic City was hardly calculated to prove that his CIO does not in actuality function, along with PAC, much as a fifth column under orders from Moscow. In hitherto conservative Rochester, the general strike was pretty surely engineered by local Reds on behalf of the new Communist demand for the right to strike against Government.

Quite surely, too, the Reds of many other cities are now using the President's "drastic" stand for furthering their long-sought "solidarity" between CIO and AFL on the local level. At this writing, also, the "Red Fascists" known to control the CIO's maritime groups announce their determination to flaunt all Government opposition to a national and international stoppage certain to deny aid and comfort to Europe's hungry millions while granting it to the Soviets.

One thing appears plain—that the country's crisis has made everyone more willing than in many years to hear Mr. Employer's story. Many wage-earner testimonies could be added to this recent pair:

"We Ford-Detroit workers learned from the GM strike that management can't be pushed around as easy as our

leaders used to tell us. It's bad enough that other people's strikes now keep us from working regularly enough to eat at all well. Young Henry is doing a grand job of housecleaning. All the same, we realize better than ever that, with our union contract still unsigned, he could, if he wanted, keep us out twice as long as GM did."

"All of us here in Toledo, whether white-collared or blue-shirted, are just about scared to death. With living costs going up every day, we're afraid that our leaders will soon demand another big raise and then shut everybody off for a month or two from the pay checks that inflation now makes more necessary than ever."

When the President's patience finally blew up, he only made still plainer these two crisis-born developments:

First, union leaders have suffered an enormous loss of prestige with their members and of confidence and respect with the entire public.

Any sympathetic ear is now sure to hear:

"We had no idea our votes to 'refer with power' would later be blamed for our strike."

"Our leaders counted so dishonestly our first ballots to accept the final settlement that we had to ask the town's preachers to count the second."

"It's harder for us members to talk with our union heads than with top management!"

"Who does Whitney think he is?"

"Why should John Lewis always make the Government come across—with us coal users left to pay the bill?"

Second, the Government's long preeminence as the sole source of "security" and all other beneficence is now hugely lessened among wage earners and all other citizens.

To such obvious reasons as inflation, OPA's confusion, failure to stand up against Lewis, and general bungling of reconversion, must be added the fact that, since the death of President Roosevelt, Government has lost its ablest special pleader and its most effective (radio) voice.

Besides praying hard that Congress will shortly restore something like fairness and justice to him, how can the industrial manager justify his country's present willingness to let him do his stuff?

It takes no crystal-gazing to figure that he will do well to throw off his defeatist attitude and tackle with renewed courage the job of making his organization into a productive team for winning profitable business and for making every one of his employees proud to be a productive member of it. But to do this he must first ponder a lot of problems bearing the label not so much of *personnel* as of *organization*. Failure is sure to mock him if he merely hands over the job of team-building to his department of industrial relations while he and his top-level associates give it a minimum of thought until a "jam" demands their attention.

Surely the time has come to rediscover the individual union member—to persuade him to insist that his leaders play fair with a management which he finds trustworthy. Doing so demands the regular, year-round, top-level raising of two fundamental questions.

Question 1. ***Our form of organization, our policies and procedures, the size and location of our plants—how fully do these secure and develop branch and departmental managers and foremen equipped to gain for us the close contacts and acquaintanceships, the sensitive understandings, the right-though-quick decisions, and the speedy communications favored by home management?***

Mere bigness is by no means the only reason why top policy is today too often formulated without the help of all the pertinent facts and, especially, without proper appreciation of all the important emotional intangibles. Sometimes the organization chart of even small outfits bars team-building by favoring too much insulation at the top, or a too military, one-way flow of information and direction. At other times top decisions are based upon the viewpoints of specialists who feel slight responsibility for the blending of their reports and counsel into the required over-all mixture of enthusiastic cooperation.

Too generally, also, the over-centralization of responsibility in supermen at the top makes it appear thrifty to employ subordinates of lower and lower ability as human engineers. Human nature brings it about that no amount of ability or wisdom in the distant headquarters can win as much loyalty as can the local official whom his workers have come to know and trust.

"If the local manager here," so a group of foremen lately told me, "had made the same speech about the issues of the threatened strike as was made by the board's out-of-town chairman, the whole matter would have been settled. The manager's not so good a speaker, but he does talk our language. Nobody here knows the chairman and therefore we have no idea just how far he should be trusted."

"Yes, most of my branch managers," said a wise executive recently, "were chosen for their ability simply to get out the stuff. But besides bringing them in oftener in order to give me the 'feel' of their local situations, I'm now insisting that, to hold their jobs, they must deserve more authority from me and win more confidence from their people, even if they have to undergo a lot of training, including public speaking." (One Cleveland president regularly discussed his problems with his assembled workers. Then he quit this habit—to be organized, for the first time, just six months later!)

Question 2. ***If we have the right kind of organization, and the kind of managerial family to keep it right and make it effective, how can we best use our present opportunity to win friends and influence our people — not to leave their union, but only to persuade their leaders to help us build a winning team for the benefit of all concerned?***

The answer requires—and the crisis favors—restatement of this underlying truth: *When all is said and done, Government, employer, and union leader must all be judged by their ability to help the individual worker to find both a productive daily job and also all the satisfactions he seeks in it.*

Too long has Government forgotten that, to meet this test, its most important job by far is to supply such a nation-wide "climate" of justice and incentive as encourages thrifty people to risk their savings for creating an abundance of demand for workers. What too many labor leaders—along with the Wagner Act's framers—have forgotten is that, while collective bargaining can help the individual enjoy certain of his job's satisfactions, it still must leave certain others up to the job provider.

This second item on top management's year-round program, accordingly, necessitates the demonstration of its genuine concern regarding these four wishes of every worker:

A. First, his desire for MAXIMUM WAGES. Towards satisfying this, the mass pressures and strike threats of collective bargaining, although enormously more costly and of less net effectiveness than usually figured, can nevertheless be called a virtually indispensable tool—except in the case of essential public utilities.

B. Similarly with his desire for MAXIMUM SECURITY against needless or arbitrary layoff and discharge. Towards fulfilling this universal hankering, unionism's wholesale compulsions can doubtless go farther than can be expected of the average job provider.

In connection with both these two satisfactions, wise management can and does do much. Naturally enough, however, the union's usefulness regarding them constitutes its two traditional "selling points." (Only to the inexperienced does the organizer promise that "Once we get a contract, we'll boss the whole damned place!")

C. The third satisfaction which every wage earner seeks in his daily task is MAXIMUM OPPORTUNITY—for a chance at not so much the higher pay, or the greater security, as the higher social status, that promotion gives.

The AFL deserves credit for its historic insistence upon maximum differentials between the skilled and the unskilled, as against the more politically minded CIO's habit of favoring its skill-less majority. But all organized labor regularly requires its exceptional member to sacrifice his personal superiority for the benefit of his mediocre companions. And, now that so many unions demand that fewer apprentices be trained, that pay incentives be shunned as mere "speed-up," and that promotion be based mostly on seniority, the meaning is plain—they thereby confess that the individual who hopes to rise according to his productivity and merit must look, not to his union, but only to his employer!

D. So, too, with the fourth and final satisfaction—the desire of every worker to take MAXIMUM PRIDE in his job and, believe it or not, in his team, as the surest means to that self-respect, that feeling of "belonging" without which he finds life unbearable.

Here again, it is to AFL's credit that some of its constituent groups make real effort to study, maintain, and develop the traditional importance of their crafts. CIO, on the other hand, is well-known for its drive to supplant all pride of job and company by loyalty only to a belligerent "working class."

To these four fundamental desires of every worker should be added his need and wish for help in a host of minor, day-by-day embarrassments of self and family—a small emergency loan, advice for finding an inexpensive but reliable lawyer, the right specialist or social agency for his problem child, etc., etc. What is worth noting is that, while many unions have endeavored to supply this help, experience has shown that they are generally less well-equipped for this than the employer.

It was the crisis of depression that brought the Wagner Act, a CIO-bound Administration, and the alleged completeness of "more money, less work, and security only." The labor crisis of 1946 may prove worth its cost if it helps us all, Government, union, and employer alike, to rediscover the individual—with each of the three expecting his confidence only so far as it serves his all-round, long-term interests, without, of course, undue hurt to the same interests of other individuals. Such rediscovery gives plenty of opportunity and challenge to each of the three. It also makes dangerous and wicked the recent interunion battles for supremacy—just as it makes dangerous and silly the kind of competition which Government, for its own shortsighted purposes, has until recently engendered between itself, along with its chosen unions, on the one side, and the employer on the other.

Political Leader, Labor Leader, Industrial Manager—which can get us all back to work again and also keep us hopeful, proud, and happy there? Because no one of them can do it alone, let's give 'em ALL a fair chance to demonstrate to us their individual members just how much of our respect and faith their concern for our well-being genuinely deserves.

MR. MANAGER, TAKE IT AWAY!

SCHEDULES THAT ASSURE LOW COST FOR ELECTRICAL INSPECTION

E. A. SKONBERG • CHIEF ENGINEER, THE MENGEL COMPANY, INC., LOUISVILLE, KY.

Inspection schedules for electrical equipment in the two Louisville plants of The Mengel Company were designed to assure high reliability of operation with minimum cost for inspection and upkeep. These schedules have been in effect long enough to show that they are accomplishing their objectives.

In the two plants there are approximately 1200 motors ranging from fractional to 200 horsepower. Most of the motors are the squirrel-cage type, a few others are synchronous, while some d.c. motors are used on special drives. High-frequency equipment (120 cycles) is also used extensively. Much care is taken to load all motors properly, and the operating conditions are good except for the presence of a certain amount of wood dust from sawing, sanding, and other operations. Despite extensive exhaust systems, a good many of the motors are exposed to some fine sawdust or shavings.

All the other electrical equipment with the exception of the main transformers is exposed, of course, to substantially the same conditions.

INSPECTION FREQUENCY

In drawing up the inspection schedules that are now in effect, every effort was made to avoid unnecessary frequency of inspections, which tends to waste money and manpower. On the other hand, it was considered just as important to have inspections made at sufficiently close intervals to make sure that defects are caught before they become serious enough to cause trouble. Here a study of the equipment record cards was very helpful, particularly in pointing out equipment that required watching because of the tendency to be troublesome.

When schedules that were considered satisfactory had been drawn up, they were embodied in separate instruction sheets, one for each type of electrical equipment. These sheets, which are given to the equipment inspectors, also contain all necessary instructions for making the inspections and tests.

MOTORS

Cleaning. Inspectors are required to see that windings, ventilating ducts, commutators, and brush rigging are kept clean.

All motors are blown out biweekly. Those operating under severe conditions are blown out daily. Air pressure for blowing out is limited to 80 p.s.i. to avoid possible damage to the insulation.

Lubrication. Directions and schedules for lubrication are based on the manufacturers' instructions. Some types of motors require daily oiling, whereas others need lubrication only twice a year. On all sleeve-bearing motors the oil is drained from the bearings and renewed biweekly.

Oilers are cautioned not to overlubricate. The inspection sheets point out that too much oil or grease is as bad as too little. The excess is wasted, it is ineffective as a lubricant, and it causes trouble if it gets on the windings.

Bearings. On important motors bearings are checked daily. For average conditions a biweekly inspection usually is sufficient.

The inspector sees whether the oil rings are turning, feels the bearings to detect excessive temperature, and looks for excessive endplay.

Air Gap. This value is checked weekly on motors that operate with excessive belt tension. For motors operating under average conditions, a check every 3 months is considered to be sufficient.

Brushes and Commutators. On important motors, and where conditions are severe, these parts are checked daily. For average conditions, a biweekly inspection usually is sufficient. Commutators must be kept smooth and the brushes seated properly to prevent arcing.

Inspectors are warned that the use of a proper grade of carbon brushes is important to prevent excessive wear of the commutator and to reduce sparking. Also, that arcing causes excessive wear of brushes and pitting of commutators, and may cause a fire.

Exposed Motor Leads. These are inspected biweekly. Inspectors are required to see that connections are kept tight, free from oil, and well insulated and protected.

Ground Connections. Inspections are made quarterly, and inspectors must see that these connections are kept tight and in good condition.

Overhauling. Most motors are overhauled annually. For those operating under severe conditions a semiannual overhauling is considered desirable.

When motors are overhauled they are disassembled in order to clean them thoroughly. After washing the parts with carbon tetrachloride or other safety solvent, the windings are painted with an oil-resisting insulating varnish. On important machines the insulation resistance is tested before restoring them to service.

Insulation Resistance. Tests are made every 3 months on all vital motors and on all those rated 50 horsepower and up. Motors that are considered to be particularly important include all those driving exhaust fans, air compressors, deep-well pumps, heater fans and vacuum pumps, elevators, hydraulic pumps, and all power house motors and generators.

The minimum allowable insulation resistance is 1 megohm. Motors showing less than 1 megohm, or those whose insulation resistance is considerably lower than the previous reading, are overhauled at once.

Insulation resistance test readings are

recorded on a simple form that shows the number and make of the motor, the insulation resistance reading, the date, and any comments that the inspector feels should be made.

If the inspection of a motor shows need for repairs, or when a motor fails, a "repair job ticket" is made out and sent to the maintenance engineer for approval. Meanwhile the motor has been sent to the electrical shop.

When considered necessary, the routine inspection of a motor is supplemented by a load test. Oftentimes checking the load with a clamp-on ammeter is sufficient. A voltage reading is taken, of course, at the same time. When a more thorough analysis is called for, a test kit is used.

Results of inspections and tests, with the records of repairs made, are filed in the 11¾x9¼-in. file folder allotted to each motor and other equipment.

ELECTRICAL CONTROLS

This classification is considered to include magnetic switches, air and oil circuit breakers, starters, compensators, and motor controllers.

All fractional-horsepower motors are equipped with manually operated starters, while those rated 1 horsepower and over have magnetic or reduced-voltage starters, all of which have thermal overload protection.

Cleaning. In dusty locations, starting switches, compensators, and air circuit breakers are cleaned and blown out at least biweekly. Cleaning quarterly or semiannually usually is sufficient under ordinary conditions.

Particular care is taken not to allow dust or dirt to accumulate on high-voltage bushings or terminals.

Contacts. Equipment subjected to severe operating conditions is inspected biweekly. Under average use a monthly check is considered sufficient. Burned contacts are filed smooth or replaced if they are considered to be in too poor condition to give satisfactory service.

Worn Parts. To insure the maintenance of proper adjustment and satisfactory operations, all control apparatus is carefully examined monthly if it is subjected to hard usage, and all worn parts are promptly replaced.

A semiannual inspection is considered to be sufficient for a good deal of this equipment.

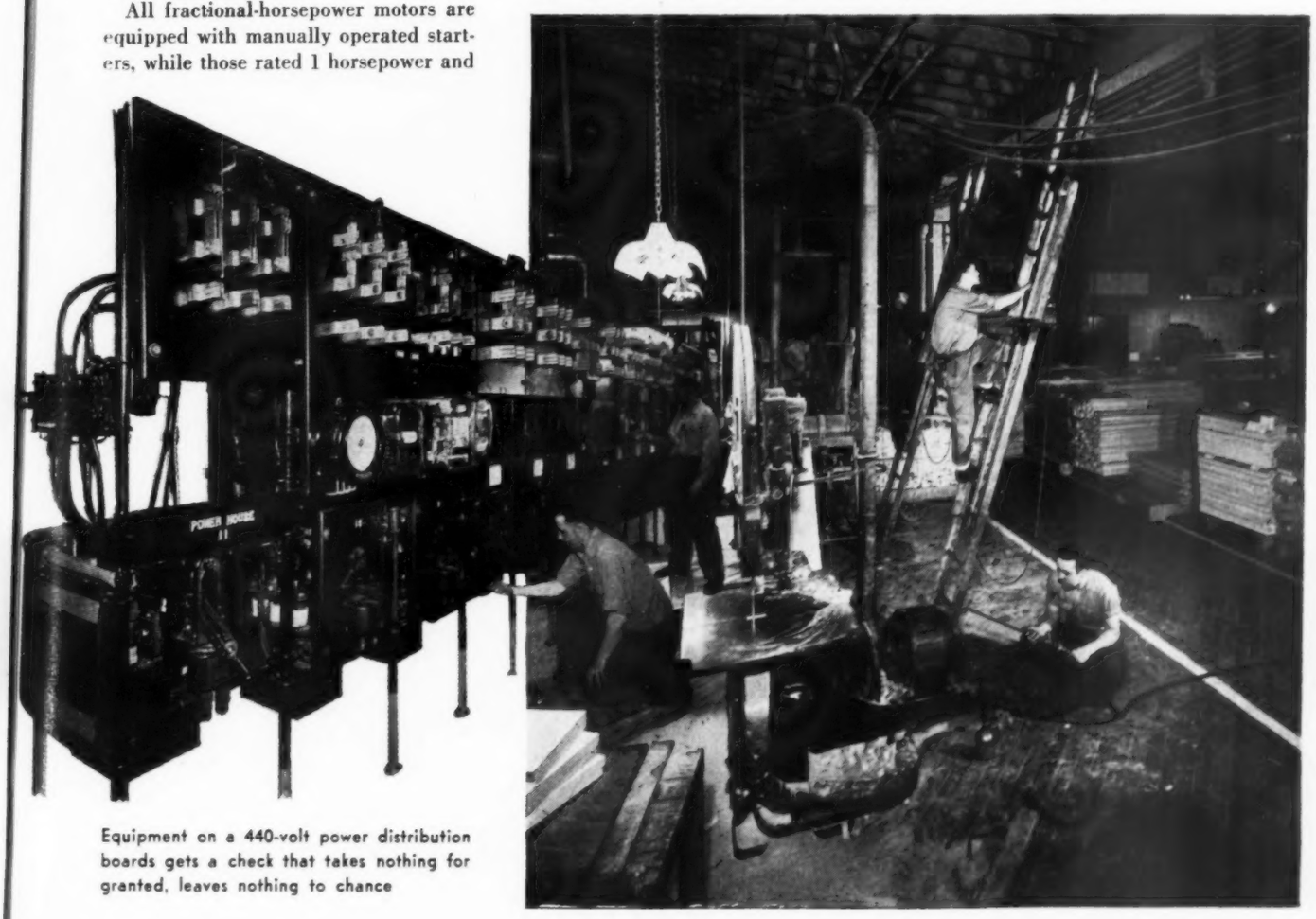
Electrical and Mechanical Connections. Where apparatus is subject to vibration it is examined biweekly for loose connections, missing or loose nuts, or broken mechanical parts. Where vibration is not present, a monthly inspection is considered adequate.

Oil. The condition and level of the oil in starting compensators, oil switches, and circuit breakers located in dirty or damp locations is checked monthly. Dirty or gummy oil is replaced at once. Inspectors must see that the oil level is kept up to the mark indicated on the tank or container.

When apparatus operates under average good conditions a semiannual inspection of the oil is made.

Overload Devices. The tripping points of circuit breakers are checked monthly. The oil in dashpots is examined and replaced if found to be thick and gummy. Orifices in plungers are cleaned out. Relays are tested every 6 months. The

This motor is blown out, lubricated, and the controls are inspected twice a week. In the background some temporary wiring is being replaced by a bus duct system



Equipment on a 440-volt power distribution boards gets a check that takes nothing for granted, leaves nothing to chance

leather bellows of relays are kept soft and pliable by occasional treatment with neat's-foot oil.

The inspector also makes sure that the heater coils for thermal overload relays are of the proper size.

Setting of overload relays is checked every six months.

WIRING

General Condition. All wiring in places where there is considerable vibration is inspected monthly. Care is taken to keep locknuts and bushings on conduits, armored cables, and other metal raceways tight; also to protect wires from oil and water. Care is taken to see that open wiring is kept tight, well insulated, and adequately protected from mechanical injury.

All wiring systems are inspected annually for unsafe conditions.

There is a standing order that temporary wiring must be replaced with permanent installations within 60 days, or removed. That order is strictly enforced because defective wiring is one of the chief causes of electrical fires.

Extension and Drop Lights. Only a good grade of rubber-covered cord is permitted to be used. Drop cords are examined every 6 months. Since extension or portable cords are subjected to more severe wear, they are inspected at least every 3 months.

Cords must be replaced or repaired at once when found to be badly worn.

Inspectors are instructed to remove all drop cords touching or suspended from nails, hooks, pipes, or other metal objects.

In hazardous locations frequent inspections of all wiring are made, ground connections are checked, and care is taken to see that lamp guards are kept in place.

Switch and Other Boxes. To prevent sparks from being blown from fuse and other boxes, inspectors are required to see that the covers are securely fastened in place at all times and that all unused knockouts are plugged. Inspections are made monthly.

In dusty locations, all boxes are blown out weekly, more frequently if necessary.

FUSES

All fuses are inspected at least twice a year to make sure that circuits are not being overfused. Inspectors must also make sure that the contact surfaces of the fuses and clips or holders are kept clean, to prevent overheating and needless blowing.

CHECKING THE LOAD AND LINE VOLTAGE ON A 125-HP. EXHAUST FAN MOTOR

TRANSFORMERS

The dielectric strength of the oil is tested at least once a year. If it shows less than 18 kilovolts in a standard tester it is reconditioned.

The level of the oil is checked at least every three months, and any loss by evaporation or leakage is replaced.

Operating temperatures of transformers that are fully loaded are taken at least once a month, oftener when necessary to make sure that a reading of 90 deg. C. is never exceeded.

LIGHTNING ARRESTERS

The resistance and general condition of the ground connections are determined once a year in the early spring, before the start of the lightning season. The maximum allowable resistance is 5 ohms.

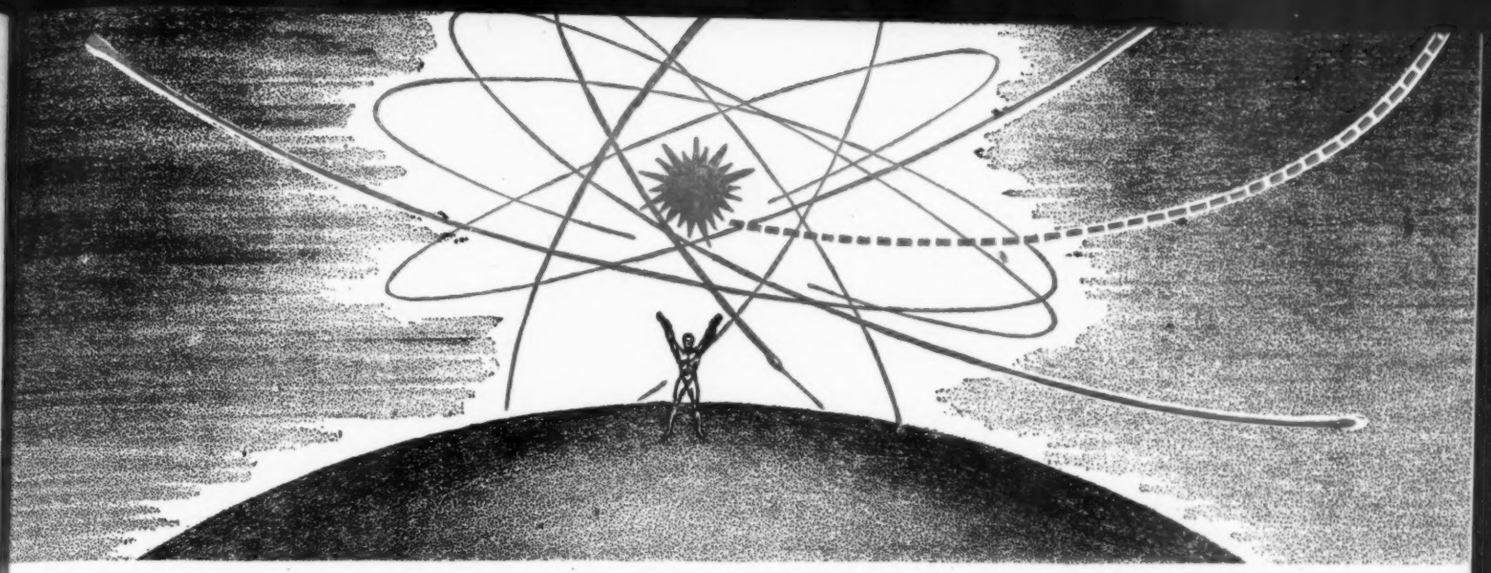
All connections are inspected early in the spring, and once or twice thereafter during the summer.

Inspectors are required to make sure that when ground wires are run through iron pipes for protection against mechanical injury, the wire and pipe are firmly bonded together.

It will be noted that the electrical department allows considerable discretion in deciding whether operating conditions are severe or ordinary, and in setting the frequency of inspection. This was done deliberately, to provide flexibility in meeting special conditions. The schedules specify the maximum period between inspections, but do not prevent more frequent examinations if they appear necessary. Inspectors and electricians know as well as or better than anyone else where the weak spots are, and it is felt that they should have all the latitude they need in discharging their responsibility of seeing that equipment in their charge is in good condition.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW** in **EQUIPMENT** (page 168) . . . a summary of **LABOR DEVELOPMENTS** (page 250) . . . things **YOU WANT TO KNOW** more about (page 242)



MAN vs ATOM—YEAR 1

WHEREIN WE SIGNALIZE THE FIRST ANNIVERSARY OF THE ATOMIC AGE, CONSIDER THE ALTERNATIVES INHERENT IN BOTH GOOD AND EVIL POTENTIALITIES OF NUCLEAR FISSION, THEN VENTURE A GLIMPSE INTO THE FUTURE

A YEAR AGO, July 16, 1945, at Alamogordo, New Mexico, man created the first atomic explosion. Most impressive events diminish in stature as they recede in time. This one grows bigger with each passing day. It truly marked the beginning of a new age.

As Year 1 of the Atomic Age ends and Year 2 begins, we are engaged in three portentous projects.

At Bikini Atoll we are detonating the fourth and, possibly, the fifth atomic explosions in the history of the world.

At Oak Ridge, Tennessee, we are building the first atomic energy plant for peaceful purposes.

Most important, in New York we and all the other United Nations are engaged in the first attempt to subject atomic energy to international control. Literally, the fate of the world hangs on this attempt.

As this introduction is written, the United Nations Atomic Energy Commission has just begun its work. People everywhere pray for its success—for their own sake, but even more for their children and for their grandchildren. If this Commission fails let everyone everywhere be warned: the world has taken a step toward destruction.

As we enter the second year of the Atomic Age, the nations of the earth are embarked on an atomic armaments race. There is no blinking that fact. We have had official notice served on us. Therefore, we must understand that unless the United Nations Commission can arrest the drift of events, we are moving toward a horrible war. The Commission must succeed.

The American delegate, Mr. Baruch, has brought to the Commission an ably thought out plan. It would internationalize nuclear science, and release for mankind the beneficent applications of atomic energy. But it would "control" atomic bombs only to the extent of giving the world brief warning of any nation's preparation to use them, so that we might have foreknowledge of disaster.

Therefore, the real and enormous task before the world becomes clear. We must end war. No other control of atomic weapons exists. If war comes, atomic weapons will be used. If they are used, our children who survive will curse their fathers. Understanding the consequences of failure, we *must* succeed.

Because we cannot succeed without knowledge, I have asked my associates at McGraw-Hill to condense into the following pages what we know at the close of Year 1 about this great new atomic force — its basic science, its possible uses and its political repercussions.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Co., Inc.

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This Fateful Atom...

LOOKING BACK twelve months to the birth of Year 1, Atomic Age, we begin to sense the majestic import of the atomic bomb that blasted the naked desert at Alamogordo, N. M., on July 16, 1945. There man first shattered atoms in an explosive *fast-chain* reaction. Then came Hiroshima and Nagasaki.

In every case the fateful atom was either uranium 235 (U235), or plutonium derived from the action of U235 on U238. Every pound of U235 atoms split in these unprecedented blasts yielded the energy of 11.4 million kilowatt-hours, or 1400 tons of coal — slightly more for plutonium.

No matter where one mines uranium ore, the purified natural uranium (Fig. 1) always contains 99.3% of the "garden" variety U238, and a mere 0.7% of the precious U235.

An atom is like our solar system. The central sun is the nucleus — a bunched mass of protons and neutrons, each weighing one unit. The planets are electrons. Each proton has one plus electrical charge — each electron an equal negative charge. There must be as many negative electron planets as positive protons in the nucleus. This is also the "number" of the atom. Neutrons have no charge, but add weight.

The atomic number of uranium is 92 because the uranium atom always has 92 nuclear protons and 92 electron planets. The isotopes U238 and U235 differ only in the number of neutrons; U238 has 146 neutrons, and weighs 92 + 146 = 238 units. U235 has 143 neutrons, and weighs 92 + 143 = 235 units.

Ordinary chemical reactions, such as TNT explosions, release only a fraction of the modest energy of the whirling electrons in the outer atom. Nuclear reactions unlock the immensely greater energies which bind together the nucleus.

Even the gentle tap of a slow-moving neutron bullet will split the atom of U235 or of man-made plutonium into two medium-weight atoms, yielding also one to three spare neutrons plus energy. Thus these *fissionable* materials supply both their own bullets and a highly sensitive lot of high-explosive targets — a perfect setup for a *chain reaction* (Fig. 2).

Chain reactions work like chain letters. Neutrons from one nuclear explosion hit and explode other nuclei. But, since atoms are mostly open spaces a chain started in a small block of U235 or plutonium quickly dies out because most of the released neutrons escape from the block.

The bigger the block, the smaller will be the percentage of escaping neutrons, and the more left to split other nuclei. When the block is rapidly built up beyond a certain secret size the fragments of 1000 nuclear fissions split many more than 1000 additional nuclei. Then fissions multiply geometrically, and the block disintegrates with explosive speed and violence — as in a bomb (Fig. 3).

This bomb explosion is a fast-neutron chain. For economy and ease of control, uranium piles for the gradual release of nuclear energy for commercial purposes will normally use a lean fuel — that is U235 or plutonium diluted with U238, thorium or other less costly materials.

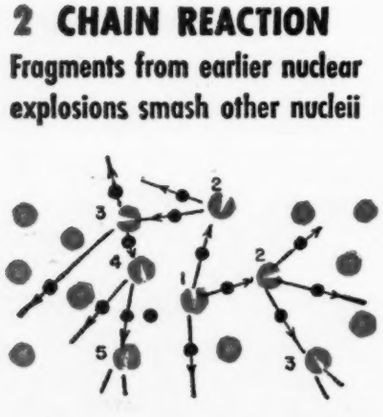
To maintain a chain reaction such piles must be large and artificially stimulated by using carbon blocks or some other *moderator* (Fig. 4) to slow many of the neutrons. Slow neutrons make more hits than fast neutrons because there is more time for them to be swerved from a straight path by the attraction of nearby nuclei, as shown below.

1 ORE TO U235

Only 0.7% of natural uranium is U235

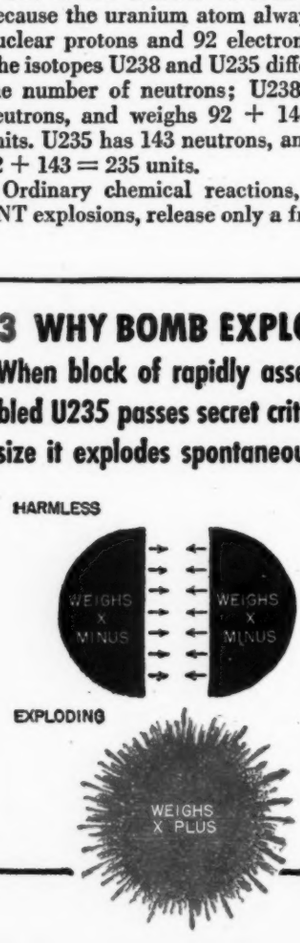
2 CHAIN REACTION

Fragments from earlier nuclear explosions smash other nucleii



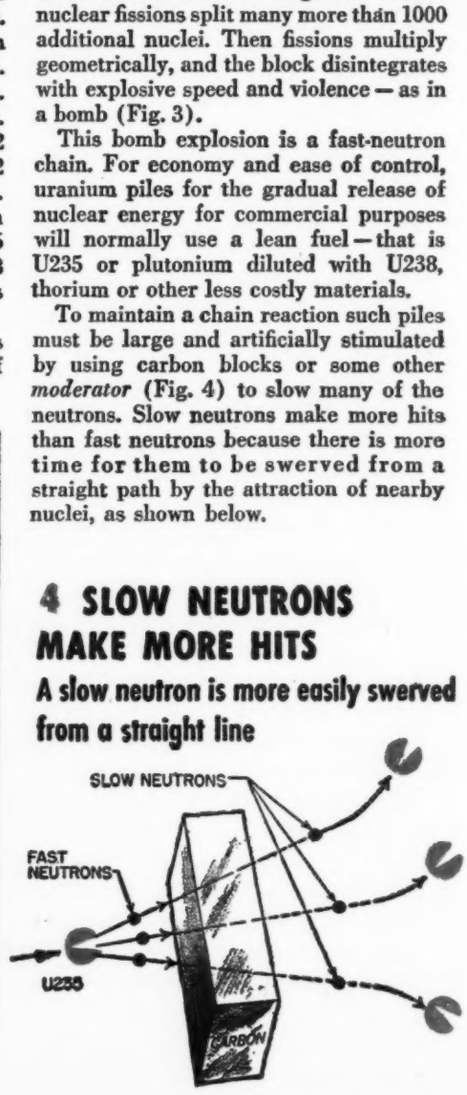
3 WHY BOMB EXPLODES

When block of rapidly assembled U235 passes secret critical size it explodes spontaneously



4 SLOW NEUTRONS MAKE MORE HITS

A slow neutron is more easily swerved from a straight line



...can Serve Man...

THE FATEFUL U235 ATOM can serve man as a new, compact source of heat energy for power generation, comfort heating or industrial processing. Peacetime applications of atomic energy will use dilute U235 or plutonium as a "fuel," mixed with carbon or some other moderator to slow some of the neutrons and thus keep the chain reaction going.

The diluting agent may be either U238 or thorium, or both. These will do double duty, because neutron bullets convert U238 into the energy-yielding plutonium, and thorium into U233, which may prove equally serviceable.

Thus the commercial piles of the future will "burn" U235 to make other atomic fuels, plutonium and possibly U233, which in turn will deliver heat energy to the pile. In that way it will be possible to get from the pile far more heat than the equivalent of 1400 tons of coal for each pound of U235 split. This highly attractive prospect will speed the day when nuclear energy can compete with coal.

While already mechanically obsolete, the piles making plutonium for bombs at Hanford, Wash. (Fig. 1) reveal the basic principle on which future piles for power and heat will operate. The heat now wasted in vast quantities will be put to work. The plutonium, now removed for bomb manufacture, will be returned to the pile (or left in) as supplementary fuel.

ATOMIC POWER

The possible everyday applications of nuclear heat pictured in Fig. 2 have been recognized from the very first day of the Atomic Age. Year 2 will see the building of the world's first atomic power plant (a pilot plant) at Oak Ridge, Tenn.

Beyond question such installations will produce power, but it may be years or decades before they prove economical. To compete with conventional plants the piles must first be redesigned to run at temperatures high enough for good power-plant efficiency. Also the techniques of operating piles by remote control through the heavy radiation screens must be radically streamlined.

The Hanford piles run on natural uranium containing only 0.7% of U235. The typical commercial atomic power plant of the future will use more than 0.7% of U235 or plutonium, but less than 50%. This will avoid both the low efficiency of the too-lean mixture and the excessive fuel cost of the rich mixture. It will permit piles of moderate size and take maximum advantage of U238 and thorium as potential sources of plutonium and U233.

One should not expect U235 to replace coal generally in this generation, although a few central power stations and ships will try it out before Year 10 of the Atomic Age. Plants far from traditional sources of fuels may turn much sooner to uranium and thorium as concentrated heat sources, that may easily be transported even to remote corners of the earth.

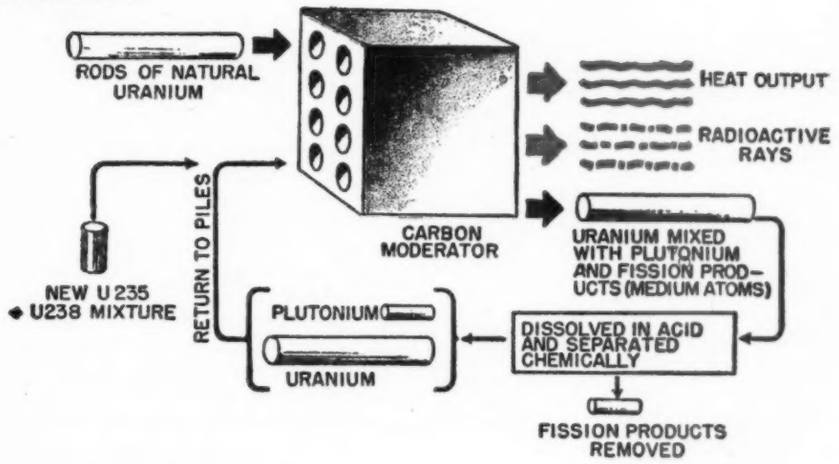
Atomic power, in forms now known, is impracticable for automobiles and small airplanes, because of the large initial investment in uranium and the need to carry 50 tons of shielding to protect riders and pedestrians against the deadly radioactivity accompanying nuclear fission.

RADIOACTIVE ISOTOPES

More immediately important than the heat and power applications of nuclear energy are the services that the radioactive byproducts of pile operation can render. Because these materials act chemically like their ordinary non-radioactive cousins, but can be followed and detected easily, they are expected to play tremendously vital parts in medicine and biology. For more details, see the last page of this section.

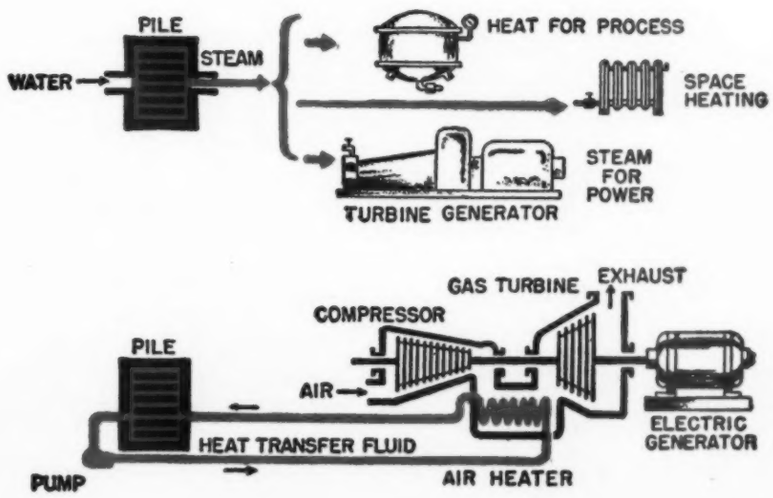
1 SLOW-NEUTRON PILE

Can make plutonium for bombs—or heat for power, process and comfort

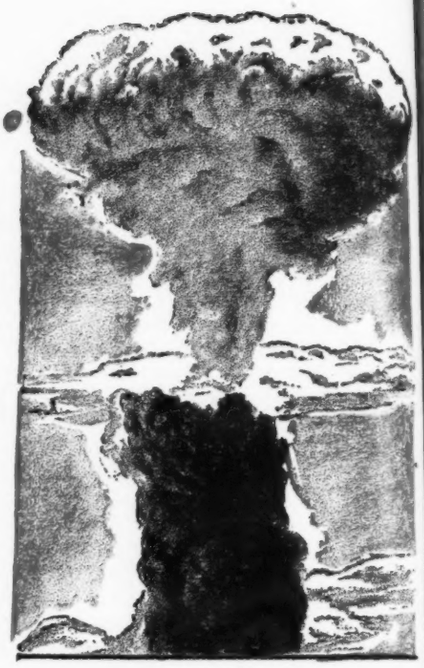


2 PRACTICAL APPLICATIONS

Include steam for turbines, process and comfort heating—also heat for gas turbines



or Destroy him . . .



A single improved atomic bomb can devastate ten square miles of city

URANIUM 235 and plutonium are now man's slaves. They will build or destroy as he orders. Man dreads this vast force only because he distrusts himself. War is proof that man in the mass has never achieved self-control. He has always sought better weapons; yet the perfect weapon now brings him no satisfaction for he sees in the atom bomb his own destruction as well as that of his enemy.

The ultimate benefits of nuclear energy may well surpass its present terrors, but the terrors are here now in awful dimension, and man must face them. He must pay this price for unlocking the wealth of the inner atom.

ATOMIC BOMB

This page, then, is about the atomic bomb. Nothing will be said here that is not either a certified scientific fact or a conclusion shared by the majority of the leading scientists, engineers and statesmen who have studied the matter.

As already explained, an explosive nuclear chain reaction spontaneously sweeps through a block of U235 or plutonium when the block is rapidly enlarged beyond a certain "critical" weight X. That weight is still a military secret; the official Smyth report vaguely suggests that it is more than 4 lb and less than 200 lb. Each piece of U235 in the dormant bomb must weigh less than X. At the desired instant of explosion the bomb mechanism assembles these pieces rapidly into a single piece considerably heavier than X.

The explosion itself drives the U235 pieces apart, thereby quenching the atomic conflagration before all the atoms are split, so the bomb efficiency is far less than 100%. For each pound of U235 (or plutonium) atoms actually split, the bomb releases the energy of 1400 tons of coal.

This explosion is mainly ordinary heat at work in unprecedented concentration. Bomb metals become incandescent vapor millions of degrees hot. This, and the enveloping sphere of glowing air, radiate a blinding flash that chars human flesh at half a mile and blisters at over a mile. There is a destructive shock wave (sound) and a second-long hurricane of unimaginable force — the outrushing of the expanding heated air. Deadly neutrons and gamma rays speed out from the bomb.

A single atomic bomb killed about 100,000 at Hiroshima. Fewer died at Nagasaki only because the circle of potential destruction included much vacant land. Bombs ten times more powerful can be made by the thousands in any major industrial country with the plants and the know-how. One bomb could saturate Minneapolis or downtown Manhattan.

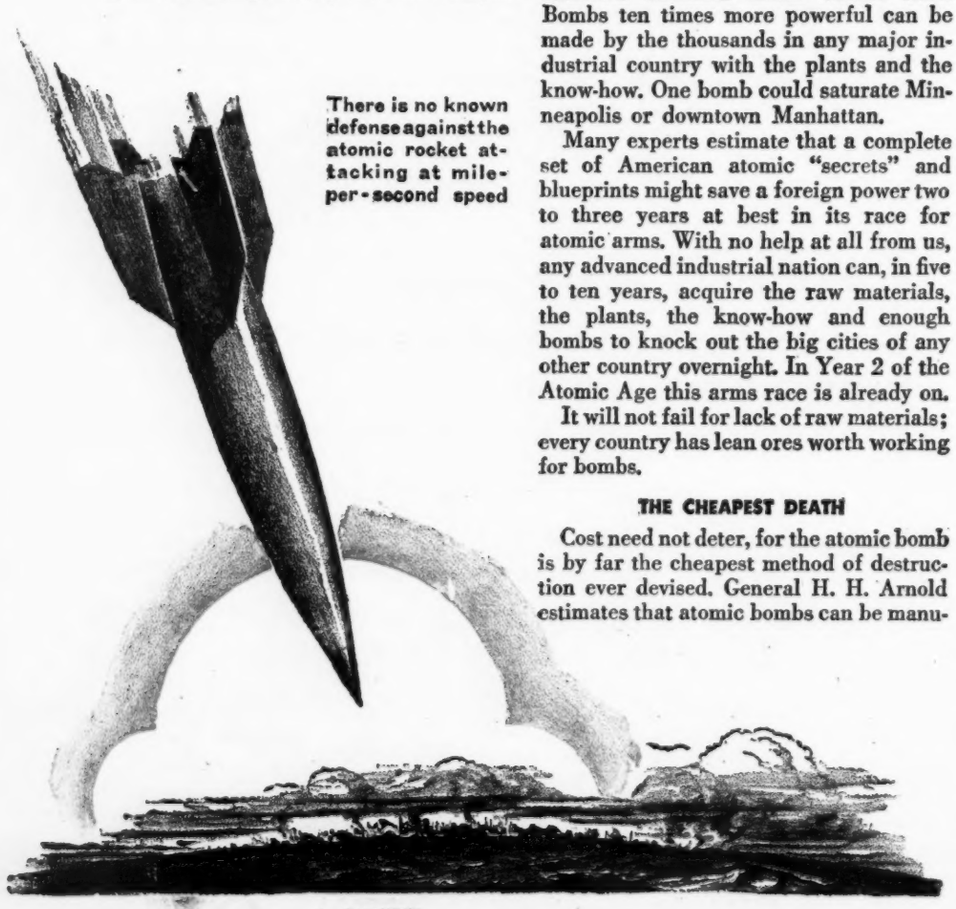
Many experts estimate that a complete set of American atomic "secrets" and blueprints might save a foreign power two to three years at best in its race for atomic arms. With no help at all from us, any advanced industrial nation can, in five to ten years, acquire the raw materials, the plants, the know-how and enough bombs to knock out the big cities of any other country overnight. In Year 2 of the Atomic Age this arms race is already on.

It will not fail for lack of raw materials; every country has lean ores worth working for bombs.

THE CHEAPEST DEATH

Cost need not deter, for the atomic bomb is by far the cheapest method of destruction ever devised. General H. H. Arnold estimates that atomic bombs can be manufactured *and delivered* for less than $500,000 per square mile of destruction.

Don't be misled by the two billion dollars America spent on a project that dropped only two bombs on the enemy. New plants can be built at a fraction of wartime cost, and the investment spread over thousands of bombs, not just two.



There is no known defense against the atomic rocket attacking at mile-per-second speed

NO DEFENSE

So the bombs can be made in ample quantity and paid for, but can they be delivered? The answer is: "Yes; by the time the bombs are ready they can be delivered anywhere and overnight." If the defenses of the target country are weak, piloted planes can get through in ample number. Ten percent would be enough.

For more effective delivery radio-steered pilotless planes and rockets can carry the atom bombs faster than sound. Such weapons will be almost untouchable by either antiaircraft artillery or manflown fighters.

Greatest threat of all will be the transoceanic rockets. The German V-2 rocket, which never once was stopped by Britain's defenders, points one way. It needs only transatlantic range (with atomic propulsion) and an atomic bomb in the nose. Forty-six feet long, loaded with 7500 lb of alcohol fuel and 11,000 lb of liquid oxygen, the V-2 of World War II rose 60 miles in the air and arced 200 miles in five minutes to deposit one ton of TNT in London.

Seeing so many strange things come to pass, the man in the street cannot distinguish between possible miracles and the impossible variety. From the very start of the Atomic Age he has been hoping for a "ray" that will explode the atom bomb far off. Competent scientists and engineers say that cannot be.

The only way to bring down a 3500-mile-per-hour rocket at a safe distance is to chase it with your own 4000-mph rocket. You can't win at this game often enough to establish ironclad protection.

The only specific defense against the atomic rocket known in Year 2 of the Atomic Age is to disperse all cities and put key industries underground. This would be very costly in time, money and national morale.

MORE AND BETTER BOMBS?

Some will ask whether the U.S., as the most powerful industrial nation, could not build more and better bombs and carriers than any other nation. Probably yes, but there is still no real security. If the "weak" opponent has enough atomic weapons to destroy us once, what advantage is there in being able to destroy him twice?

Shooting first could protect us now, but not after the world is atomically armed. If we were to destroy the enemy's cities, we would probably miss his well-concealed and protected bomb magazines and rocket launchers. A few minutes later he could return the atomic fire. In brutal simplicity, that is the picture of future atomic war. Everybody loses.

At this point one grasps at another straw: "If everybody is to lose who would be so foolish as to start an atomic war? And didn't the Germans refrain from using gas for a similar reason?" Possibly yes. It *may* work that way. But in a world atomically armed to the teeth some nervous finger *may* pull the fatal trigger.

ONLY ONE WAY OUT

Throughout history each new offensive weapon has called out its appropriate defense. But now the offense leaps centuries ahead in a single bound and the defense lies almost helpless everywhere, unless some technical protection, unknown as Year 2 begins, can be devised.

The situation is extremely dangerous. There is no clear way out except through some sort of international action first to stop the atomic arms race and, before it is too late, to hobble war itself.

Can it be done? Perhaps not, but there is no alternative except atomic chaos.

...so he faces the Atomic Dilemma...

THE NUMBERED statements that follow in somewhat logical pattern are too fateful to be accepted on anybody's say-so. Every reader should test them in the light of his own information and understanding.

The points below sum up the conclusions of the previous article — and these in turn reflect a great mass of thought and discussion among leading scientists, engineers and statesmen close to the problem. To an amazing degree they concur on both facts and conclusions. For authoritative statements of their line of thought, in detail not possible here, the reader should see the recent book, *One World or None.*

THE DILEMMA

Nations must either face the probability of an atomic World War III, which would surely be the most deadly in history . . .

***Or*, the experts propose, yield both atomic weapons and war potential to international authority backed by superior force.**

What the Experts Say

1. In five to ten years any major industrial nation can make enough atom bombs to destroy all the major cities of any other country overnight.

2. This assumes no "secret" information or other help from us.

3. The necessary uranium ores will be at hand.

4. The cost will not be too high.

5. The bombs produced can then be carried thousands of miles by bombers, or by atomically powered guided missiles moving faster than sound.

6. There will probably be no effective military defense against such weapons.

7. Dispersing cities, and putting key industries deep underground, will give some protection if accomplished in time, but at incredible cost in money and human discomfort.

8. In a world atomically armed, nations can probably protect their bomb stocks and rocket launchers from enemy assault.

9. If so, nation A can destroy the cities of any other nation B, after which B's rockets will destroy the cities of A. Shooting first will not win an atomic war.

10. This knowledge may not restrain the trigger finger of a suspicious power.

11. Having more and better atomic weapons than the other fellow won't help much if he has enough to destroy us. No use to kill a man twice or rebomb urban ruins.

12. Every nation is vulnerable in the Atomic Age, including the U. S. A.

13. National security will be impossible without (first) international control of atomic arms and (not too long thereafter) international control of all war potential, both backed by superior physical power.

14. If action to this end is long delayed, it may become impossible to halt the atomic arms race already started.

15. At best, the necessary degree of international control, with some real delegation of national sovereignty, will be a revolution in human affairs. It may prove to be humanly unobtainable at this time. If so, men and women everywhere must face the probability of an atomic third world war—by far the most destructive in all history.

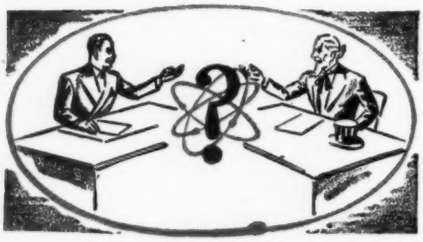
In this atomic age no nation can be safe through its own unaided might

...and the Great Debate unfolds

ATOM YEAR 1 has probably been marked by more debate on a single subject than any other twelve months in the world's history. Social, economic and political as well as purely technical issues have been pressing for realistic solution. Let us look at these issues and see where we stand:

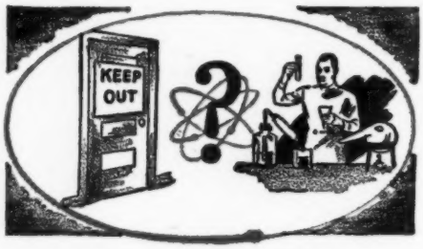
CIVILIAN VS. MILITARY

Because the atomic bomb is the world's greatest weapon, the armed forces would like to control it. But because atomic energy can also be used for peaceful, beneficial purposes, civilian control seems equally essential. These conflicting viewpoints had their strong proponents before the Congress which finally reached a fairly satisfactory compromise in the Atomic Energy Bill of 1946, setting up a competent civil board with which the armed forces will have continuing liaison. As we go to press, just before Year 2 of the Atomic Age begins, this bill has passed the Senate, but there is still a question how rapidly it will be enacted into law.



PRIVATE VS. PUBLIC

Atomic energy is "too big" and "too hot" to be handled privately. It must be nationalized and internationalized. The questions are *how* and *to what extent.* Fortunately, as the "boxes" on these pages show, there are means that may attain reasonable safety against misuse of the atom, and still do so without public control of many "non-dangerous" applications.



SECRECY VS. FREE SCIENCE

Throughout the first year of the Atomic Age hot debate has raged around "keeping the secret of the bomb." To prevent potential enemies from making atom bombs some have urged a complete blackout of all phases of atomic energy — even of the scientific fundamentals of nuclear physics. Others have sought immediate and complete disclosure of all bomb "secrets," both scientific and technological. These have held that such information cannot be effectively hidden, that secrecy blocks progress and breeds wars.

A year of debate has brought the great mass of vocal opinion to this middle ground: (1) Ease restrictions on the exchange of basic physical knowledge. (2) Release for industry's benefit many of the devices and methods developed for the bomb project. (3) Hold tight to specialized information on atomic bombs and bomb-material production until international safeguards are fully operative.

DOMESTIC CONTROL AS PLANNED IN THE ATOMIC ENERGY BILL OF 1946

McMahon Committee Bill contains the following provisions.

Policy. Declares it the policy of the U. S. to develop and utilize atomic energy to improve the public welfare, increase living standards, strengthen competitive enterprise and promote world peace.

Organization. Establishes the Atomic Energy Commission (AEC) of five administrators to direct four divisions on research, production, engineering, and military applications—to work in liaison with three committees from (1) the armed forces, (2) outstanding civilians, and (3) joint Congressional representatives.

Production. AEC to own and operate (under management contracts with industry if deemed desirable) all facilities for the production of fissionable materials, such products to be distributed with their radioactive byproducts under license for private industrial and medical research.

Military Application. AEC to engage in development work and produce atomic bombs as directed by the President, to be delivered only on his order to the Armed Forces.

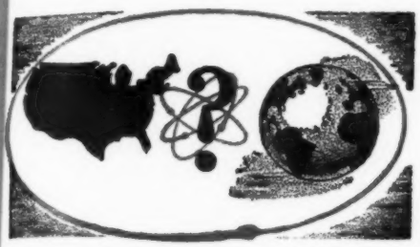
Industrial Utilization. Permits AEC to conduct research, design and manufacture equipment for atomic-energy utilization, license its use, produce and sell power obtained as a byproduct in the production of fissionable materials. Directs AEC to give widest safe scope to private initiative.

Control of Information. AEC to enforce a ban on the dissemination of restricted data that might be used to injure the U. S. or secure advantage to a foreign nation, yet to provide leeway for ultimately relaxing restrictions as future conditions warrant.

Patents and Inventions. No private patents permitted for production of fissionable materials or their utilization for military weapons, but AEC will justly compensate for such inventions, when made by private citizens. Patents for non-military applications may be purchased or condemned by the AEC only when public interest is affected.

Appropriations. "Such sums as may be necessary and appropriate to carry out the purposes and provisions of the act" *plus* unexpended funds of the Manhattan Engineer District.

ds while Time runs out



NATIONAL VS. INTERNATIONAL

Born of nationalism, the Atomic Age began when three nations discovered a weapon that today gives them the greatest military power on earth. The prime question is: Shall the atom remain the servant of its conqueror, nationalism?

During Year 1 of the Atomic Age the Truman-Atlee-King declaration, the masterly report of the State Department's atomic consultants, and the U.S. representative on the United Nations Atomic Energy Commission, have all called for international control of atomic energy. Year 2 will start with no such control. This failure to decide and act is in part a natural result of the extreme difficulty of the problem and the obvious dangers of unwise decisions. Nations everywhere face a triple dilemma in this Atomic Year 2: the dangers of nationalism, the dangers of internationalism, the supreme danger of not being able to make any decision in time to meet the atomic bomb threat.

INTERNATIONAL CONTROL AS PROPOSED BY THE U.S. TO U.N. ATOMIC COMMISSION

Baruch statement follows constructive path laid out by Atomic Consultants in "Acheson-Lilienthal Report."

The Plan. The U. S. has proposed that all nations band together to outlaw the use of atomic energy for war and to promote and harness its development for the benefit of mankind. To this end an International Atomic Development Authority would be set up, and to it the U. S. would turn over, at various stages of its organization, all atomic bombs, know-how, raw materials, facilities, and stockpiles of fissionable material. Thus IADA eventually would supersede national authorities on some matters and supplement them on others.

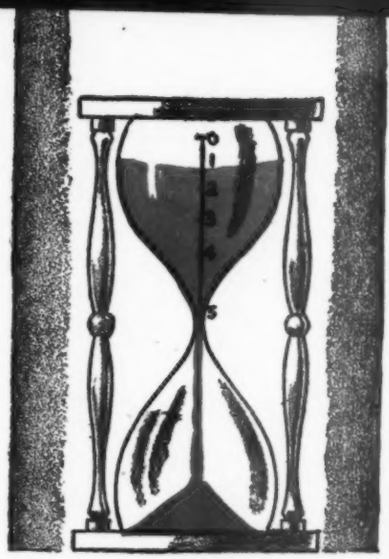
Owner and Operator. IADA would take over from national authorities or private ownership full management and control of all atomic energy matters that afford a possible threat to World security. These include:

1. Raw Materials—Supplies of uranium and thorium to be inventoried, controlled, and developed by IADA.
2. Facilities—IADA to control and operate plants producing fissionable materials and to own and control their products.
3. Research—IADA to undertake research and development on all aspects of atomic energy and to possess exclusive right of research on atomic explosives.

Private Initiative. Will have its chance to push forward the use of atomic energy for peacetime (non-dangerous) purposes. With IADA providing raw materials and carrying out necessary inspection, national and private enterprise may operate "safe" power piles, and produce and use radioactive isotopes for research, clinical and other applications. Radioactive isotopes produced by IADA also can be distributed for peacetime use.

The Mechanics of Safety. No plan is a certain guarantee against future atomic war. This plan should, however, prevent surprise attack with atomic weapons; for IADA is to buttress positive ownership or management controls with wide powers of inspection. Obviously, successful inspection rests on complete freedom of access or egress in any area.

Sanctions. At the heart of the plan lies the problem of penalty for violation — a matter for profound statecraft. To the U.S., one aspect of sanctions appears crystal clear: Here is an area where the veto right now held by the five great Powers must be redefined if it is not to be incompatible with the meaning and purpose of the proposed control.



Leading industrial nations can produce atomic bombs in five years, competent scientists announced after Hiroshima. Already one year of the precious five has been consumed in debate without international action. Soon it may be too late to check the growing momentum of the atomic arms race.

TIMETABLE—ATOM YEAR 1

1. **July 16, 1945.** World's first atomic bomb detonated in New Mexico.
2. **July 26, 1945.** President Truman and Prime Minister Churchill issue Potsdam ultimatum threatening Japan's destruction if she continues.
3. **August 6, 1945.** Atomic bomb dropped on Hiroshima.
4. **August 9, 1945.** Atomic bomb hits Nagasaki.
5. **August 11, 1945.** Army releases Smyth Report on "Atomic Energy for Military Purposes."
6. **August 14, 1945.** Japan accepts terms of Potsdam declaration.
7. **November 15, 1945.** Truman-Atlee-King issue declaration of intention and procedures looking toward international control of atomic energy by United Nations.
8. **March 28, 1946.** State Department issues Acheson-Lilienthal Report on the "International Control of Atomic Energy."
9. **April 12, 1946.** Manhattan Engineer District announces program for experimental development of atomic power.
10. **June 1, 1946.** "Atomic Energy Bill of 1946" passes Senate unanimously, is referred to House of Representatives.
11. **June 14, 1946.** First meeting of United Nations Atomic Energy Commission (Bernard Baruch as American member). Manhattan District announces availability of radioactive isotopes for research use.
12. **July 1946.** Joint Army-Navy tests of atomic bombs at Bikini.

...but if Man Masters Atom

IF MUTUAL DESTRUCTION by the atomic bomb can be avoided, the first century of the atomic age will bring immense advances in scientific knowledge, health and living standards. Already many prospective benefits can be outlined, but those we can neither foresee nor suspect may be even more important.

This prediction is grounded in scientific experience; the most fundamental discoveries have always been the most fruitful. The study of molecules gave us chemistry. Faraday's experiments with electricity and magnetism are the foundation stones of the great electrical industry. Can one expect any less from an understanding of the heart of every atom?

BENEFITS

Atom-splitting benefits clearly visible today fall mainly in three classes: (1) heat and power applications of the uranium piles; (2) general industrial applications of equipment and methods originally developed for the bomb project; (3) chemical, biological and medical uses of the "tagged atoms" (radioactive isotopes) now abundantly available from pile operation.

It is now evident that the energy yield of the U235 in an atomic pile can be multiplied many times by returning to (or leaving in) the pile the plutonium and possibly the U233 produced respectively from the U238 and the thorium in the pile. This is an indirect way to "burn" inexpensive U238 and thorium, and thus greatly extend the supply and reduce the cost of atomic fuels.

POWER APPLICATIONS

Although present piles run at low temperatures, it is certain that temperatures high enough for the efficient operation of steam and gas turbines will be attained. Already an experimental atomic power plant has been ordered. Atomic power for certain remote installations (say, for heating Arctic airports) may not be far off.

In five or ten years uranium piles will be driving a few experimental ships and submarines. In 20 or 30 years uranium may begin to compete widely with coal as a fuel for suitably situated large central heating and power plants. The 50-ton minimum weight of shielding rules out nuclear power for automobiles and small piloted planes.

SPECIAL USES

Some day ultra-high temperatures from splitting atoms will be used for special industrial operations on metals and other materials. Even the dread atomic bomb might easily serve peaceful ends — blasting lakes in deserts, changing the course of rivers, leveling mountains.

INDUSTRIAL BYPRODUCTS

The special industrial equipment and methods developed for the bomb project will find hundreds of important uses — mostly for purposes unrelated to atomic energy. These developments include pumps with neither seals nor leaks, leak detectors of amazing sensitivity, ultratight welding, a portable mass spectograph for quick and automatic gas analysis, new ways of handling corrosive and poisonous materials, new diffusion barriers for the separation of gases and of petroleum products.

TAGGED ATOMS

Yet more important than any of these, in the long run, will be the hundreds of radioactive isotopes now available as by-products of pile operation. Chemically indistinguishable from the ordinary forms of the elements, these isotopes serve as tagged atoms or "spies" if mixed with common stable atoms of the same species. They "fly with the flock," and can later be identified as surely as banded birds. With these amazing tools of research, the course of any element or compound may be traced through the bodies of men, animals and plants. Similarly, tagged atoms may be used in studying the course of many kinds of industrial and chemical operations.

BIOLOGY AND MEDICINE

A suspected hyperthyroid condition can be diagnosed by feeding the patient a minute measured amount of radioactive iodine. The click of a "Geiger" counter placed on the patient's neck will tell (1) what percentage of the swallowed iodine concentrates in the thyroid cells and (2) how rapidly that concentration is accomplished — giving a definite indication of the state of the gland.

In similar fashion the radioactive isotopes of hydrogen, oxygen and carbon will trace out the intricate transformations of carbohydrates and proteins in the human body. Radioactive phosphorus will explore the bones. Radioactive iron will show how and where blood cells are formed. Radioactive sodium will time the circulation of blood.

USES IN INDUSTRY

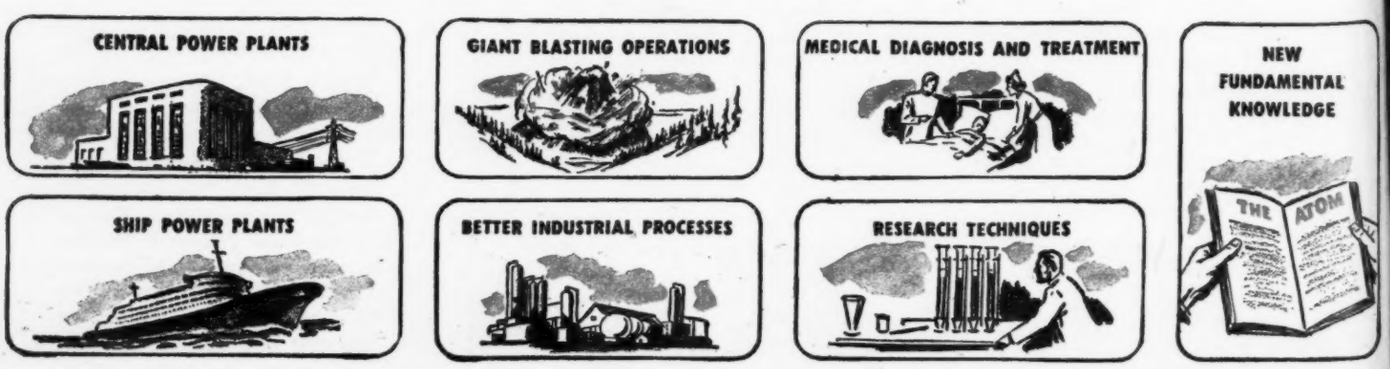
In chemistry the radioactive isotopes will speed the understanding of metallurgical and organic reactions. In industry they will measure flow, detect leaks, and do other useful work.

Meanwhile the uranium piles will be manufacturing certain radioactive isotopes that can serve as cheap but effective substitutes for high-cost medical radium.

KNOWLEDGE COMES FIRST

It is already clear that the chief benefits of atom splitting will come first as new scientific knowledge rather than as new engines and gadgets. But in the long run man's new understanding of the inner atom will enrich the whole range of human activity. This has always been the case with less fundamental discoveries in science. It can hardly be less with this most fundamental discovery.

ATOM SPLITTING WILL SERVE MAN IN:



FACTORY MANAGEMENT AND MAINTENANCE • Plant Operation Library No. 95 • June, 1946

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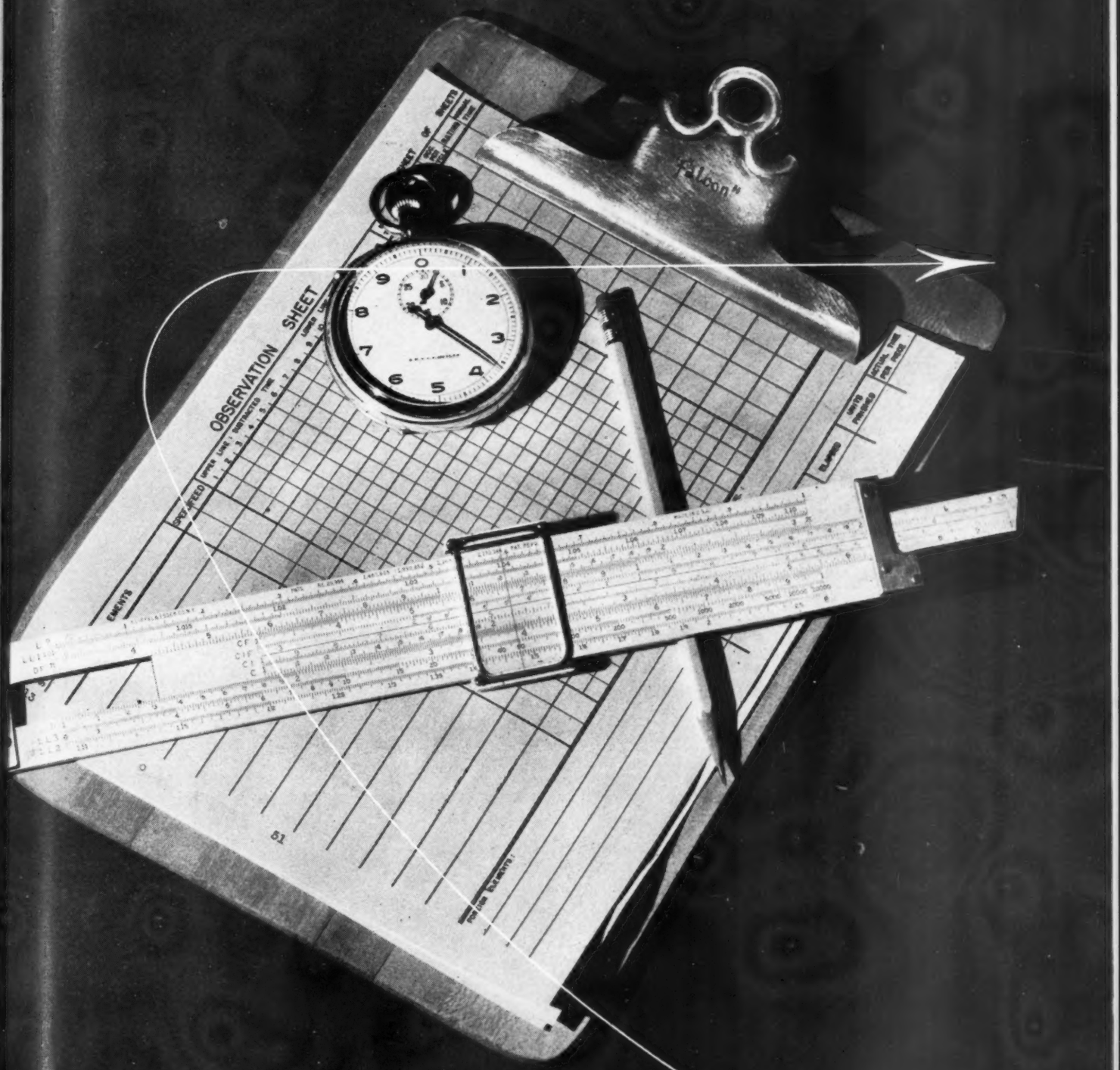


Work Measurement

RALPH M. BARNES • PROFESSOR OF INDUSTRIAL ENGINEERING, UNIVERSITY OF IOWA

There is considerable evidence to show that group effort rating exercises such as this aid experienced time study analysts as well as beginners in doing a better job

a program for improving

1

Have the time study men make simultaneous time studies of motion picture films of factory and office operations. Determine time standards and tabulate results. A good method for presenting the results of such time studies is shown in Figure 4.

2

Have the time study men make simultaneous time studies of actual factory operations either in the shop or in the conference room. Use experienced operators and actual factory jobs. Determine time standards and tabulate results as shown in Figure 4.

3

Have the time study men rate card dealing, filling pin board, block tossing, assembling paper, and short-cycle factory and office operations. Keep careful records; plot results; compute systematic error, mean deviation, and absolute error when standards are available.

techniques of work measurement in the plant

The upward trend of hourly wages is daily increasing the need for accurate determination of the amount of work that can reasonably be expected of a qualified operator. For half a century, time study has been the recognized method for setting the standard time to do a given job. As a basis for wage payments, it is producing satisfactory results in many organizations today, but it is not yet the perfect tool that it should be. If time study is to increase in usefulness, new and better techniques for work measurement are a must for management.

Work is largely a combination of mental and manual effort expended in a given period of time. Most factory work and much office work is primarily manual in nature, and manual work can be measured with a considerable degree of accuracy.

The value of work is determined by its results rather than by the amount of energy expended by the worker. It is a person's productivity, his accomplishment, that measures his worth, whether he works for himself or for an employer.

Time study provides the only known satisfactory way of determining what constitutes a normal day's work. So-called standard data and standard time values for carefully defined hand motions and combinations of hand motions are also satisfactory inasmuch as these time values are originally obtained from time study data or from micromotion study which are adjusted for operator speed. It is highly desirable to use standard data for setting time standards whenever it is economically feasible to compile and validate such data. However, in many kinds of work, the cost of developing such data cannot be justified. In these cases, individual stopwatch time studies must be used, even though the results are less likely to be consistent.

In most organizations, time study and standard data are used as the basis for wage incentive plans. A standard day's work is the amount of work expected from a person in return for his base pay or his guaranteed hourly wage. Then, when an incentive system is used, the workers are paid in direct proportion to their output over and above the standard. Because measurement of work is such an important factor in setting wage rates, it is necessary to examine critically the techniques used for work measurement.

Basically, time study procedures are similar throughout the country. The operation to be studied is first broken down into its elements, and the performance of these elements or subdivisions is timed with a stopwatch. A representative time (in many plants it is the average time) is selected for each element. The relative pace or speed at which the person worked while being timed is estimated and recorded. This

SUGGESTIONS to the FACTORY MANAGER or CHIEF INDUSTRIAL ENGINEER

Sufficient data are available to show that industrial engineers can definitely improve their ability to rate operator performance and set time standards. The program outlined below is now being followed by a number of organizations, with good results.

4

Have the time study men rate a series of walking operations, varying the speed at random from 75 to 150 percent of normal. Have each man plot his ratings on a graph similar to Figure 2. Compute the systematic error, mean deviation, and absolute error. Repeat this experiment once each week for two or three months. Use the same person as the subject of the experiment throughout.

5

Cooperate with other industries in the locality in making a "Time Study Survey." Obtain facts to show how "normal performance" or "normal effort" in each plant compares with the average for the other plants in the community.

is usually referred to as an effort rating or performance rating, and is related to a "normal" of 100. This rating factor is applied to the measured time, and a normal time for the operation is obtained. This normal time is the theoretical time that it should take a qualified person working at a normal pace to do the job. Allowances are then added for personal time, for rest for overcoming fatigue, and in some cases for delays. The result is the standard time for the job. This is usually expressed in minutes per piece or in units to be produced per hour.

Of the several phases of time study, that of rating effort or speed is the most difficult. Moreover, effort rating requires the exercising of considerable judgment by the time study analyst.

It has been suggested that both the employer and the worker should know what the standard day's work is on the job, and that both should know each day if that standard has been met, whether an incentive system is in use or the workers are paid on a flat hourly basis. Nearly every person wants to know what is expected of him, whether he operates a machine or manages a department in the plant. It is human nature to want some means of measuring accomplishment. Even in the schools, grades and report cards let the student know how he is doing.

EFFORT RATING

It is widely recognized that there is a marked difference in the speed at which different people naturally work. For example, some people walk at a fast pace while others merely amble. The time required for a person to cover a given distance will vary directly with his walking speed. Speed or effort can be rated. If studies made in a hundred or in a thousand factories and offices showed that the normal walking speed was, say, three miles per hour, then a definite standard could be established for use in rating the task of walking.

If a task consists of going from one place to another and if walking three miles per hour is normal or 100 percent, then it is possible to employ a percentage rating factor with precision in measuring performance or accomplishment. The question now arises as to the ability of industrial engineers to judge speed of walking or the speed of doing other physical tasks. To know this, several questions must be answered:

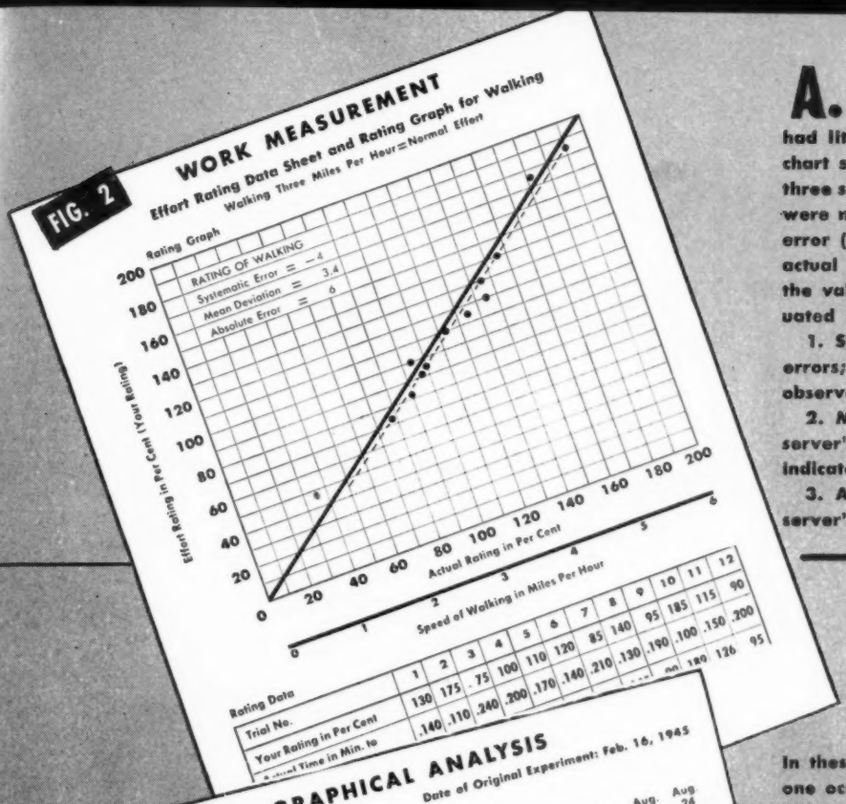
Q. ***How much variation would be found if an engineer rated a series of a dozen different walking speeds?***

Q. ***How would the same man rate the same walking speeds a week or a month later?***

Q. ***Would an observer do a better job of rating if he received instruction and practice at periodic intervals, and, if so, what is the best way he can be given such training?***

Q. ***If nine time study men from the same company rated a given operation, how would their ratings differ? If they all made a complete time study of the operation, how would their time standards differ?***

FIG. 2


WORK MEASUREMENT
Effort Rating Data Sheet and Rating Graph for Walking
Walking Three Miles Per Hour = Normal Effort
Rating Graph
RATING OF WALKING
Systematic Error = −4
Mean Deviation = 3.4
Absolute Error = 6
Effort Rating in Per Cent (Your Rating)
Actual Rating in Per Cent
Speed of Walking in Miles Per Hour
Rating Data
Trial No.
Your Rating in Per Cent
Actual Time in Min. to

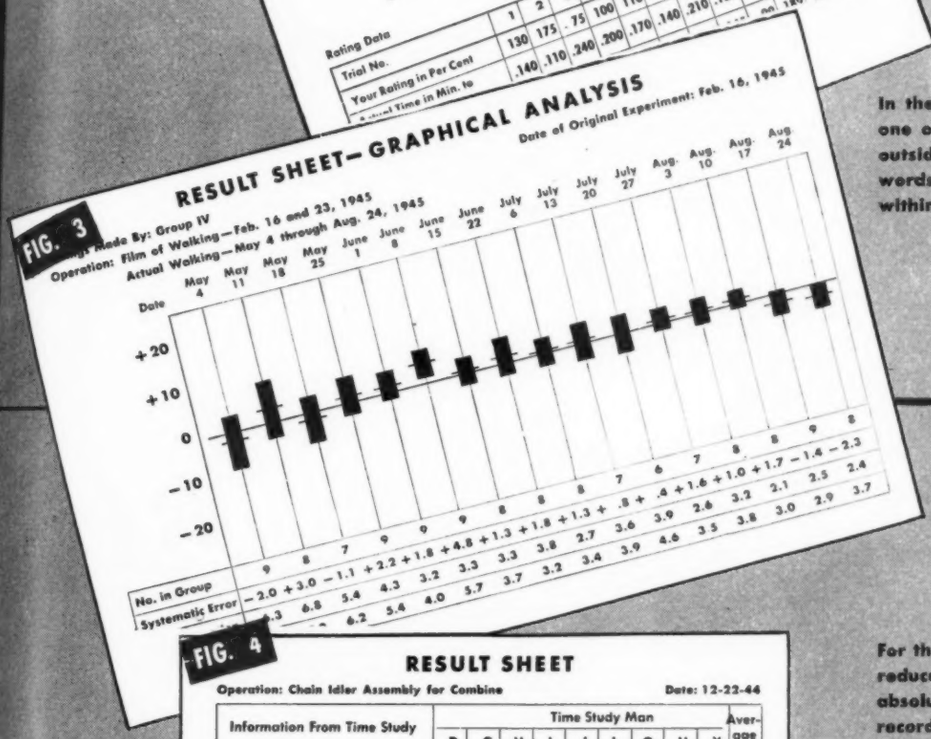
A. Figure 2 is is typical of ratings by men who have had little or no previous training in effort rating. This chart shows the results of ratings made on the third of three successive days, during each of which twelve ratings were made. It will be noted that the maximum absolute error (point 6) is slightly more than 11 percent from the actual speed. There are three other standards by which the validity of the time study man's work can be evaluated (numerical values are from Figure 2):

1. Systematic Error, −4. Algebraic mean of observer's errors; indicates how much too high or too low the observer was, on the average.

2. Mean Deviation, 3.4 . Average deviation of observer's ratings from his own mean or systematic error; indicates *variability* of observer's ratings.

3. Absolute error, 6. Average deviation of the observer's ratings from the actual ratings.

FIG. 3



A. The same group of nine men rated the operation of walking every week for four months. The results are shown in Figure 3. In these observations of actual walking, there was only one occasion, June 8, on which the systematic error fell outside the range of plus or minus 3 percent. In other words, a competent engineer can repeatedly rate effort within very narrow limits.

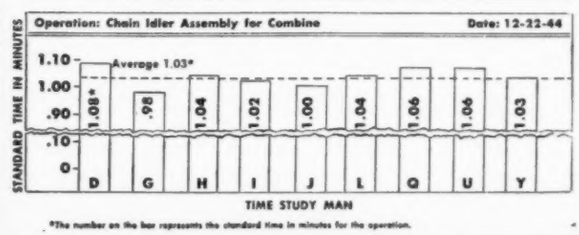
FIG. 4

RESULT SHEET

Operation: Chain Idler Assembly for Combine — Date: 12-22-44

Information From Time Study	Time Study Man									Average
	D	G	H	I	J	L	Q	U	Y	
1. Number of elements	9	7	9	10	9	8	11	8	13	9
2. Performance rating factor	110	105	105	105	100	105	110	110	110	107
3. Personal allowance in per cent	5	3	3	3	5	5	5	5	3	4
4. Delay allowance in per cent	2	2	3	2	2	2	2	2	2	2
5. Fatigue allowance in per cent	2	4	2	5	5	2	3	4	3	3
6. Total allowances in per cent	9	9	8	10	12	9	10	11	8	10
7. Total standard time in minutes	1.08	.98	1.04	1.02	1.00	1.04	1.06	1.06	1.03	1.03
8. Piece work price in dollars per 100 pieces. Base rate = $0.75	1.35	1.25	1.30	1.27	1.25	1.29	1.32	1.32	1.29	1.29

Results of a time study made by nine different time study men.



*The number on the bar represents the standard time in minutes for the operation.

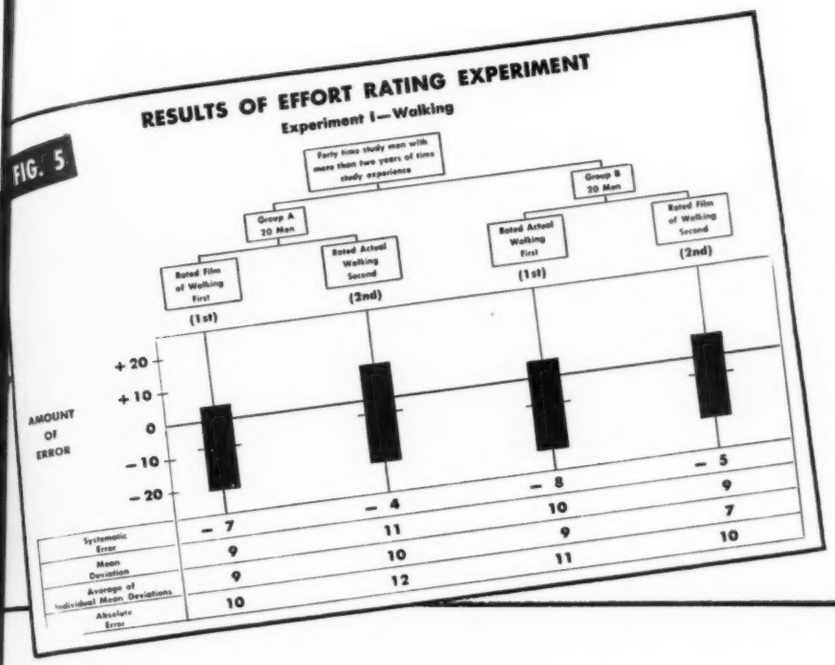
A. Figure 3 provides evidence that the men will do a better job if they receive continuing training. The men in the group reported spent 3 hours each week on improving their technique, and the results show it. For the four months, the mean deviation was successively reduced from 5.7 to 3.4 to 3.2 and finally to 2.6, and the absolute error from 6.5 to 4.3 to 3.8 and 3.3. A similar record was achieved by these same men in rating effort for card dealing. Mean deviation, 5.8, 4.1, 3.3, 2.9; absolute error, 5.5, 5.3, 4.1, and 3.8.

A. Figure 4 provides answers to both these questions. The performance rating factors varied from 100 to 110, but it will be noted that, by and large, those who reported the lower ratings consciously or unconsciously compensated for this by greater allowances. Total standard time in minutes computed by these nine men varied from 0.98 to 1.08, with an average of 1.03, a variation of less that plus or minus 5 percent, and seven of the men were within plus or minus 3 percent.

Q. Since investigations of rating can be made most conveniently by studying motion pictures, how does the rating of the film of an operation differ from the rating of the actual operation?

Time study men from five plants of the J. I. Case Company making a time study. Practice and standardized techniques, enabled them to set rates for this job independently, with no rate varying more than plus or minus 5 percent from the group average

FIG. 5



A study was made of 40 men, each of whom had had more than two years' time study experience. The results are shown in Figure 5. These men were divided at random into two groups, and one group rated a film of walking first, and then the actual operation; the second group reversed this procedure. For each of these groups, slightly better results were achieved in the second series of ratings, *regardless of the order* of film and actual observations. Similar results were obtained when the group was again divided, and a study made of the difference between the rating of film and the rating of the actual operation in the case of card dealing.

These and many other questions should have been answered years ago. A few universities and isolated groups have made sufficient check studies to convince themselves that experienced engineers can establish time studies that are satisfactory, but by and large only generalities are available in the literature to support such claims. The accuracy of the stopwatch time study technique is generally accepted, but where are the data to support this important management technique? Likewise, there is little dispute that a good time study man, using good procedure, can obtain satisfactory standards, but few people can prove it. The solution seems to lie in having every factory manager and chief industrial engineer proceed without delay to check periodically the procedure used by every industrial engineer in his plant.

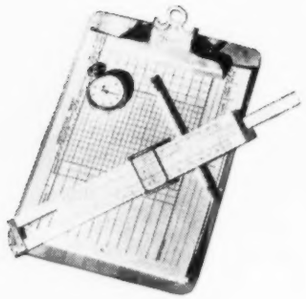
IMPROVING TECHNIQUES

Some companies conduct time study clinics for their own men at regular intervals, not only to keep them "on the beam" as to their rating ability, but also to check all phases of their time study procedure. These companies have in their records today complete time studies made simultaneously by all time study men of the same operator. They have rating curves for film loops which have been standardized, and they know what the high and low fluctuations are among their time study men. However, such companies are the exception rather than the rule. Many organizations, in normal times, made wage rate surveys in order to be sure that they were paying the going rate in the community. Is it not equally important that similar studies be made to determine the amount of work that time study men require for normal performance? It is not enough to know that the men of one company are consistent within themselves, it is also necessary to know that a standard day's work in the plant is the same as that for similar industries. Nor is it enough for a manager to have a hunch that his plant is "about in line"; he should have complete data to show exactly how he stands. Top management should require this information, and it would be no surprise if the union of the future demanded it.

In discussing wages, the statement is frequently made that a "fair day's pay for a fair day's work" is the objective sought by both labor and management. This statement needs more than casual examination. A fair day's pay is something that changes with the times and the conditions. However, a fair day's work does not change. It is independent of the wages paid. In fact, people would have a clearer understanding of the problem if the standard time to do a job were separated from the wages paid for doing it. A standard day's work is all that is expected of a person regardless of the wage he receives.

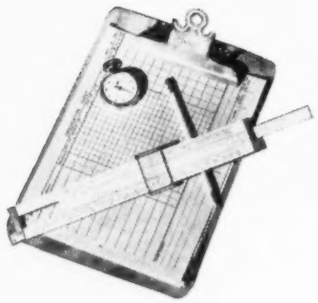
The ultimate objective of time study men must be the establishment of a national and international standard for performance level. Preliminary work toward this goal has been undertaken by the Society for the Advancement of Management, and top management should lose no time in lending its support to the solution of this important problem. One approach is to produce a series of motion picture films of typical manual operations, and have these films rated by a large number of experienced industrial engineers. These films might then serve as standards for comparison throughout the country. It will take considerable time and money to validate such standards, but it will be time and money well spent. However, such a program will not materialize overnight; it must be built upon firm foundations. To that end, small groups of plants should pool their efforts to arrive at community-wide standards. The natural expansion and consolidation of such programs will bring the goal in sight.

Two cases are briefed on the next page. One illustrates how identical



case 1

One organization with plants in 55 cities in North and South America is using identical time standards on operations which are the same in all its plants. Many of the standards are originally set in Chicago and are used without change in the other plants. It should be added, however, that a program of motion study and complete standardization of the operation precedes the setting of the rate. This organization insists that the method used in each of the plants follows the one prescribed by the main office, if the time standard is to apply. The procedure followed, in most cases, is this: The standardized method is developed in the Chicago plant, and a motion picture is made of the operation. A "simo" or simultaneous motion-cycle chart is made of the operation, showing graphically the motions made by the left and the right hands. The film and the simo chart are then dispatched to the other factories, and the local industrial engineer uses this information in setting up the job and training the operator in the standardized method. With the operations thus standardized, it is not necessary to repeat time studies in each plant, and the rate determined at Chicago can be immediately applied.



case 2

The company referred to here has five plants in four midwestern states and employs a total of about 10,000 people. The company has been in business many years and has used time study in all plants for a long time. Its case illustrates what may be accomplished through a systematic attempt to improve time study procedure. Prior to the inauguration of time study conferences, each plant had its own time study procedures, and there was almost no exchange of information among the plants. As might be expected, the time study methods differed, the forms used were not all alike, and there was considerable variation in time standards for identical jobs performed in the several plants.

The first of a series of seven conferences of the time study men was held at the main plant in August, 1943. The assembled time study men from the five plants discussed common problems and agreed that they should work toward a standardized time study procedure. A new time study form was designed, and it was decided to adopt the best known stopwatch practice.

The succeeding conferences were held at intervals of two or three months, and the discussion was continued, and broadened to include effort rating. Practice rating sessions were held, jobs were set up in the conference rooms, comparative results were discussed, films were examined, and stopwatch time studies were made. Most of the charts and graphs accompanying this article are based on work which was done at these conferences.

time standards are being used in a company with 55 plants. The second illustrates what may be accomplished through a systematic attempt to improve time study procedure.

Several factors contributed to the success of the program described in Case 2. Among them the following seem to be most important:

1. Top management was in complete sympathy with the program and was determined that the company should make use of the best time study techniques known.

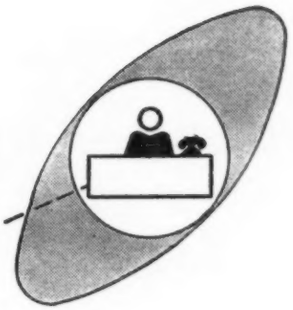
2. A capable man was selected to direct the program. It was his belief that company personnel should work out the details of their program rather than buy a "ready-made system" which might leave employees feeling that they had been treated too impersonally.

3. Every time study man was made to see the merits of having a standardized time study procedure for all plants, and each man contributed to the development of a workable system. Incidentally, the program has now expanded to include such things as dedetermination of allowances, analysis of down-time, development of a "methods improvement program for foremen and supervisors," and the determination of standard data for use in all plants.

4. The plant managers and other executives in the organization were kept informed as to the details of the program and the progress that was being made.

5. A bound, stencil duplicated volume of proceedings was prepared following each time study conference, and served as a progress report. A copy went to the vice-president in charge of production and to other executives, as well as to each time study man. A reproduction of every time study made during the conference (but omitting the time study man's name) was included in the volume, as well as summary sheets similar to Figure 4. These reports have been successfully used by the management in discussing with the union the ability of time study men to determine accurate, consistent, and fair standards.

Looking Ahead in Business



last-minute round-up as we go to press . . .

Labor peace—long hoped for—is not likely to come with the settlement of the major industry disputes. There's still some fairly serious trouble ahead.

Wage pressures will be increased further when the price rises caused by the recent wage boosts show up in the cost-of-living charts. Labor wants wages upped again to make up for the higher cost of living which previous wage increases forced. **More wage increases will necessitate still higher prices. Here you have the makings of an inflationary spiral.**

•

There's some hope in volume production. *If production could get going full speed, pressure on prices would ease. Labor's demands might be more reasonable. That's why Bowles wanted another no-strike pledge from labor. He recognized need for maximum production for at least a year to stave off inflation threat.*

A few major contracts are scheduled for reopening soon, such as meat packing, oil, textiles, Lockheed. But these are not considered as dangerous to stabilization as others that may be revised as to wages on short notice if economic conditions warrant. These include Chrysler, rubber, anthracite coal, and many more.

Half the contracts signed the first three months of 1946 may be opened on this basis. If living costs skyrocket, pressure may be brought to hike even those wages presumably frozen until next year—for instance, steel, Ford, General Motors, electrical manufacturing.

Cincinnati printers found a way of accomplishing such a purpose. Their wages had been frozen until 1947. When the printing companies refused to consider wage increases earlier, the printers said they no longer would work overtime. **The companies gave in.**

This experience is making unions reluctant to freeze wage terms for a long period of time. *(They'll change their feelings if deflation sets in.)* They also will want to bargain separately on wage issues. This would eliminate old-fashioned horse-trading.

•

Trend toward industry-wide bargaining and monopoly unions is reducing competition for labor and wage differentials. Strikes are tying up whole industries, rather than plants or corporations. This gives labor tremendous power.

The United Automobile Workers-CIO have set up a Wage-Contract Coordination Department. They want industry negotiations, equal pay for equal work wherever it is performed. First step will be corporation-wide agreements.

This union considers piecemeal approach to wage contracts as costly to all concerned. Reuther puts it this way: "Months after settlement of the wage question in the primary manufacturing plants, we are still fighting, and sometimes we are forced to strike to gain acceptance of the basic wage increase pattern in the parts industry, thus interrupting production in plants where there is no wage dispute. The maximum degree of stability will not be achieved until a rational over-all wage program is effected which will take labor out of competition."

Emulating John Lewis, unions already are pressing for employer-financed welfare funds. *This was expected after the blessing given them by the Government in the soft-coal case. Not wishing to ape his rival, Murray will still concentrate on a guaranteed annual wage for his steel workers. OWMR advisory board is undertaking a study of the possibilities and ramifications of an assured income plan in basic industries. It will have some results available for Murray's negotiations.*

•

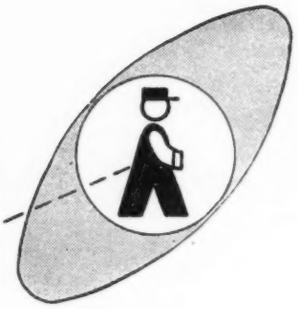
Whatever labor legislation comes out of Congress, we are headed for compulsory arbitration in basic and critical industries. Industry is re-examining its inherent opposition. It's one way of resolving disputes when bargaining fails.

Denunciation of Truman for his labor legislation proposals and failure to put over his labor program with Congress has been bitter in the labor press. *Organized labor feels he is anti-labor at heart, will oppose his nomination in '48.*

Plant seizure to end strikes is on the way out. Truman doesn't want to be bothered, except in most critical cases. Wants parties to sweat it out.

CIO wins and AFL loses in Gerard Reilly's resignation from NLRB. There'll be fewer split decisions with James Reynolds, brother of the liberal Quentin, serving in Reilly's place. Opponents of foremen's unions have lost an ally in Reilly's departure. Despite CIO opposition, Reilly could have had another term. He decided it was time he made some money for his family.

Looking Ahead in Labor



last-minute round-up as we go to press . . .

IN the next few months industry will get a chance to show what it can do with strikes at a minimum and with prices that promise to yield a reasonable profit. The more production we can get by year's end, the better our chances of avoiding a boom next year and a bust sometime later

A wave of price increases will follow the new price-control bill. Results will be both good and bad.

On the good side, production will get a shot in the arm as profit margins move toward normal. But don't expect too much too soon. Goods that have been held back will hit the market as soon as new prices are set, but it will take some time to work them out. And even longer to get production rolling on goods that haven't been made in quantity because of price ceilings.

On the bad side, higher prices mean that unions will be around sooner with bigger wage demands. Industrial prices, already up 5 percent in the past few months, will probably rise another 15 to 20 percent by year's end. Food prices and rents will also go up, boosting the cost of living about 10 percent.

This, on top of the 3 percent rise registered since the 18½c wage pattern was set, may well mean that the next round of wage demands can't be settled for less than 15c an hour.

What will happen after that is anybody's guess. It's too far in the future to say with any certainty whether such a wage increase could be absorbed in rising production and productivity, or whether it would touch off a dizzy spiral leading to a serious bust.

•

One of the most encouraging factors in the business outlook is the way industrial production snapped back. Preliminary figures indicate a new post-war high in the third week of June.

What has happened is that production of non-durables and building materials continued to rise during and after the strikes, and that steel mills together with metal-working plants stepped up faster than had been expected, once the strike hurdle was passed.

Steel mills turned in an outstanding performance. *Despite shortages of coal, coke, and scrap, steel operations hit 86 percent of capacity by the middle of June, almost double the strike low. This won't ease the steel shortage much, but it will enable steel consumers to increase their production faster than had been forecast.*

Paradoxically, the fact that over-all industrial production as well as production in most lines will soon establish peacetime records doesn't signify the end of the inflationary threat. Shortages of materials, components, and manpower will hold output of most things below demand. Nevertheless, high production is an essential first step in avoiding a boom and a bust.

•

Employment is still rising, but rate of increase is slowing, mostly because there are fewer applicants. Bureau of Labor Statistics estimates May employment in non-agricultural establishments at 37,435,000, half a million above April and equal to V-E Day level. **June should see another sizable gain as heavy industry and construction take on more workers.**

Unemployment in May totaled 2,300,000, the same figure reported in April. As veterans return to jobs, women continue to retire.

Labor turnover statistics reflect the growing tightness of the labor market. April layoffs, 13 per 1000 workers, equaled early 1942 rate and was only half the April, 1939, rate. Quits stood at 43 per 1000, comparable to wartime rate.

Don't be misled by talk of a buyers' strike and a depression early next year. Careful analysis of all the factors shows no grounds for such pessimism.

There's not much chance of a buyers' strike when income payments are more than double 1939 figures, and still rising; when unemployment is near rock-bottom; and when there is a tremendous backed-up demand.

Of course, as more goods go to market people will refuse to pay outrageous prices for shoddy goods. Moreover, as more autos, refrigerators, and other hard goods are produced, people will spend more of their income in these lines, lessening the present abnormal demand for soft goods and for services. *Neither of these developments will signal a buyers' strike, however.*

The thing to be concerned about is not a buyers' strike. It is the danger that we can't avoid a spiraling boom with wages and prices chasing each other to such dizzy heights that a smash is certain. The smash wouldn't come early next year, but might come in 1948. Increasing productivity would go far toward checking such a ruinous spiral.

A FIVE-POINT PROGRAM FOR PREVENTIVE MAINTENANCE

H. G. WIEST, JR. • ELECTRICAL ENGINEER, E. I. DU PONT DE NEMOURS & COMPANY, WILMINGTON, DEL.

The conclusions, as expressed in the "do's" and "don't's" given here, have been reached by the author as a result of his experience and the experience of other du Pont engineers in the company's plants. They constitute summations of many specific cases.

1. Establish records of each major piece of equipment, such as motors, starters, transformers, generators, turbines, presses, mills, conveyors, listing complete nameplate data and service experience. It is convenient to use card or loose-leaf files, so that they can always be kept up to date. In addition to the nameplate data, don't forget to show catalog numbers of frequently ordered parts.

2. Set up a systematic procedure to make sure that certain maintenance services are performed at the proper intervals. Typical services include lubricating motors, lubricating machines, changing oil in oil-immersed starters, changing oil in transformers, reconditioning motors, reconditioning starters.

In one plant systematic motor lubrication is insured by the following method:

A pocket-sized notebook is ruled in lines and columns. The first column shows the motor number, which is made up like this—the first number indicates the motor horsepower; the letter following shows the building or department or factory area; the next number is an arbitrary serial number assigned consecutively to all motors of the same horsepower rating.

The next columns give location of motor and type of lubrication, and the remaining columns provide means of noting the exact date of lubrication, and the initials of the man doing the job.

The time interval for performing the various maintenance services must be determined by local conditions. Don't leave the lubrication interval up to the whim of the workman; it should be decided by supervision.

3. Establish a program for checking the electrical condition of all electric equipment periodically. It is imperative that tests be made with instruments at intervals not exceeding 1 year. Record tests of insulation resistance and ground connection resistance of all equipment in a log sheet, which provides room not only for identifying the equipment and recording the tests, but also for recording the action taken to correct faulty conditions.

Transfer the insulation resistance values from the log sheets to the equipment record cards for comparison with previous readings. In this connection it should be emphasized that a single reading of insulation resistance does not give a true picture of the condition of the equipment unless it can be compared with previous readings. It is the increase or decrease in insulation resistance that is significant, rather than the absolute value—hence the importance of keeping records.

In the periodic testing of ground connection resistances include (1) the grounding of the frames or cases of motors, generators, transformers, switchgear of all types, and solid or perforated metal enclosures for all types of electrical equipment; (2) system grounds and lightning arrester grounds; (3) static ground connections of non-electrical equipment in areas classified by the National Board of Fire Underwriters as Class I or Class II hazardous locations. No permanent records of ground resistances are necessary, because, unlike insulation resistance, only the present value is of interest.

4. Don't rely on visual inspection. Use it only to supplement the above described tests. Record notes regarding visual inspection on the log sheet.

5. Establish a check-back system whereby repairs will be reported back so that the record on the log sheets will always be up to date. Don't discard the log sheets until those from the next periodic inspection are available.

INSTRUMENTS REQUIRED

The essential instruments required for preventive maintenance testing are (1) an insulation resistance tester operating at a test potential of at least 500 volts, operated by hand-crank or self-contained batteries; (2) a low-reading ohmmeter capable of measuring resistances as low as 1 ohm. Instruments are available which combine both of these functions in a single case.

Other instruments that will pay their way in a few years in any plant large enough to employ a full-time electrician are (1) a clip-on ammeter for spot-checking motor and transformer loads; (2) a recording wattmeter with suitable current and potential transformers, for checking over-all power requirements; (3) a hand tachometer for checking machine, belt, and motor speeds; (4) a multi-range voltmeter for checking line voltage.

For those who must be convinced by definite figures that they are paying for preventive maintenance whether they are getting it or not:

1. Go through the maintenance records for the past year and list the total cost of breakdown repairs. Include all time charged to each job, and from records or from memory list the cost of idle time of operators and so on which contributed to the total cost, the value of spoiled product, or the cost of reclaiming damaged product.

2. Estimate what these repairs would have cost if they had been done on a scheduled basis, not forgetting that the repairs might have been less extensive if the breakdown had been anticipated.

3. The difference is the amount that would have been available for making regular inspections and keeping up-to-date records for a preventive maintenance program.

4. Don't try to estimate the cash value of the intangibles, since any such evaluation will be open to argument. But bear in mind that a well-maintained plant makes a more consistent product, has better worker morale, and fewer management headaches than a poorly maintained plant.

Here the oiler is paying his daily visit to a bottle filling and capping machine. The lubrication truck was designed and built by the maintenance department, carries all material needed for the day's work

PLANNED PROCEDURE REDUCES LUBRICATION COSTS 32.5 PERCENT

J. E. BURNS • PLANT ENGINEER, MAINTENANCE AND UTILITIES, E. R. SQUIBB & SONS, BROOKLYN, N. Y.

Application of planned lubrication procedures chalked up a saving of about 32.5 percent during the first three months of this year, compared with the same period in 1945. The trend indicates that the over-all saving for the remainder of this year will be equally gratifying.

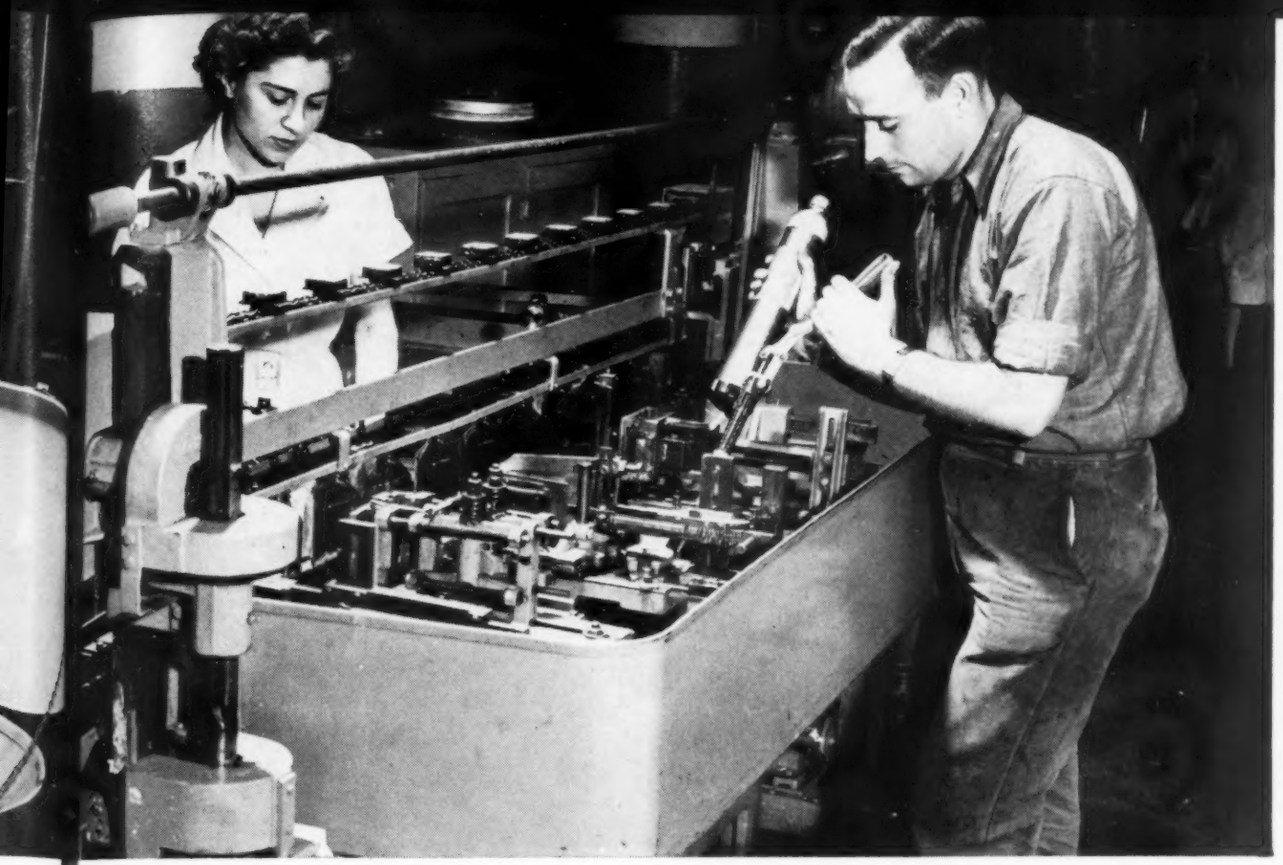
Along with this direct saving in dollars there has come a marked decrease in production downtime caused by frozen bearings, worn parts, and other troubles caused by poor lubrication.

During the past few years the difficulty of obtaining new equipment and spare parts, and the necessity for operating on a 24-hour schedule, strongly emphasized the need for adequate preventive maintenance schedules. It was realized that properly planned and executed lubrication schedules will greatly reduce breakdowns. Therefore the development of such schedules was started. The first step involved making a list of every piece of equipment in the plant.

The assistance of one of the major oil companies was accepted in making a survey on which the new lubrication schedules and procedures could be based. The results of the survey indicated that a considerable saving could be realized through the use of specific oils and greases. Also, a decided reduction could be made in the number of grades of lubricants then in use.

The lubrication engineers instructed the maintenance personnel in the proper technique of applying lubricants. The maintenance men who were concerned with lubrication were given a 3-week course of training, during which they were thoroughly instructed in the application of the various types of oils and greases and the frequency of application. They were familiarized with all vital moving parts, such as bearings, spindles, and cams, of all equipment, and learned where the lubrication points of the various machines are. Particular stress was placed on the proper lubrication of parts that might by chance come in contact with any products, since extreme care must be exercised to avoid contamination.

This detailed instruction is necessary because of the extremely wide variety of equipment used in the manufacturing operations. It was estimated that approximately 20,000 places exist where lubricants must be applied at intervals



There are many points on this complicated packaging machine that require lubrication daily. From the standpoint of lubrication requirements, this machine is typical of much of the equipment found in the plant of E. R. Squibb & Sons

"Properly planned and executed lubrication schedules will greatly reduce breakdowns"

Kinds of Lubricants and Their Application

Lubricant	Where Used
OIL A	Light machinery Air compressors Vacuum pumps Motor bearings
OIL B	Large compressors
OIL C	Medium, heavy machinery
OILS D & E	Refrigerant oils
OIL F	Light spindle oil
OIL G, cylinder	Heavy-duty gear unit Right-angle and combination master gearhead units
OIL H	Parallel-shafts Gearhead unit
OIL I	M-G homogenizer
OIL J	Hydraulic systems
Grease A	General-purpose grease Motor bearings
Grease B	For heat conditions
Grease C	Exposed gears

ranging from once or twice a day to once every three months.

Following the lubrication survey, a list of the oils and greases that would cover all requirements was drawn up. Then charts were made showing the lubricant to be used for every piece of equipment on each floor of the plant. Two of these charts are posted in convenient locations on each floor, for the use of the oiler. Hence, there is no excuse for failure to use the proper lubricant at each lubrication point on every machine.

Check tests for acidity and proper viscosity of all lubricants are made periodically.

The machine shop foreman was given over-all responsibility for lubrication. Under him there are four oilers who had received the training mentioned previously. Each of these men has been assigned a certain territory which he covers daily, six days a week. Territories are not rotated at present, although it is planned to arrange for such change in territories.

The men are held responsible for the lubrication and proper functioning of all bearings and sliding surfaces in their territories. Each oiler has a log book in which he records daily the machines lubricated and the grade and kind of lubricant used. These records are checked daily by the foreman to make sure that the proper procedures are being followed. Hence, the opportunities for neglect of lubrication, or failure to use the proper material, are under control.

It has been found advantageous to pay a trifle more for lubricating oils and greases than cheaper grades would cost, since the benefits thus gained have contributed much to the trouble-free operation of the equipment. The more expensive lubricant seems to condition the surfaces of bearings, gears, slides, and chains, and thereafter adherence to a properly scheduled oiling and greasing routine will keep them in shape.

The result is less friction, less wear, less heat, less noise, and, obviously, a reduction in power consumed. In addition, the inherent characteristics of the more expensive lubricant enable it to function long after the point at which cheaper lubricants become acid, causing corrosion, pitting, or breakdown, and fail to lubricate.

operating shorts

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for

BRONZE ARMOR PREVENTS WEAR OF STEEL RAM

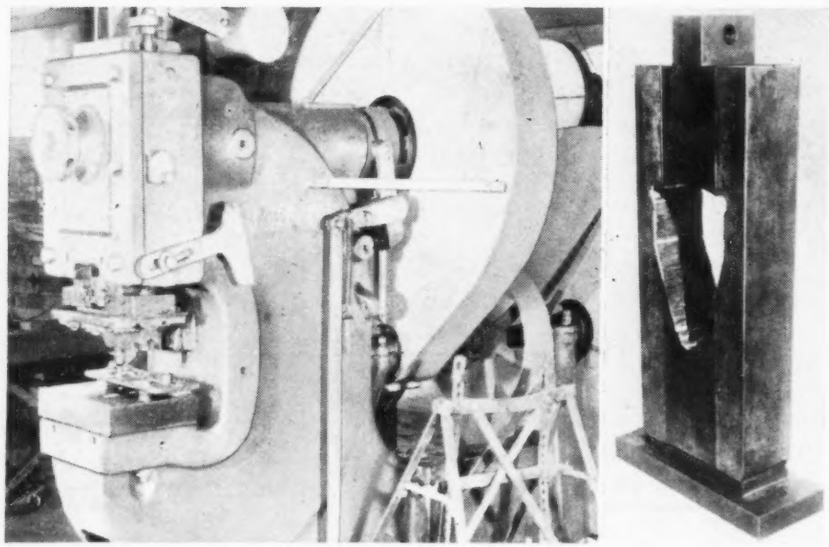
SOURCE: Metallizing Engineering Company, Inc., Long Island City, N. Y.

When a ram on one of the punch presses at the International Steel Company, Evansville, Ind., pulled in two on the return stroke, while trying to pull the punch out of the work against the stripper plate, the company found itself faced with a difficult replacement problem. The firm that had originally made the press was out of business, and none of the other companies approached had a ram that would fit.

Finally, International decided to make a ram from steel plate. First, a blueprint was made from the broken ram. Next, a piece of steel was burned to within a half-inch of the size needed, then taken to the toolroom and machined to exact size.

The question then arose of how to keep the steel ram from galling in the cast-steel ways of the punch press. After preparing one side of the ram at a time, it was sprayed with bronze, put back in the shaper, and the next side prepared. Only one side was sprayed at a time to prevent grease and dirt from getting on the other three sides in handling from the shaper to the spray booths. The fourth side was not sprayed, because a brass shim was used to take up the side wear on the ram. After all three sides had been coated, the ram was machined back to proper size.

About 50 pounds of metal were used to spray approximately 500 square inches. Made in 50 hours, it is believed that this ram will be in good shape long after the punch press itself is worn out. This steel ram cost about $225. For a cast-iron ram, it would have been necessary to make a pattern, and then have the casting machined, at a total cost of about $400. By making the ram about four days' time was saved.



Replacement problem arising from a broken punch press ram was solved by making a new one in the company shop. Steel plate was sprayed with bronze, machined back to exact size. Result is a ram that is stronger, will probably last longer than the cast-steel original

APPLIES D. C. TO STOP MOTOR QUICKLY

RALPH MORIN, Maintenance Supervisor, Boston Gear Works, Inc., North Quincy, Mass.

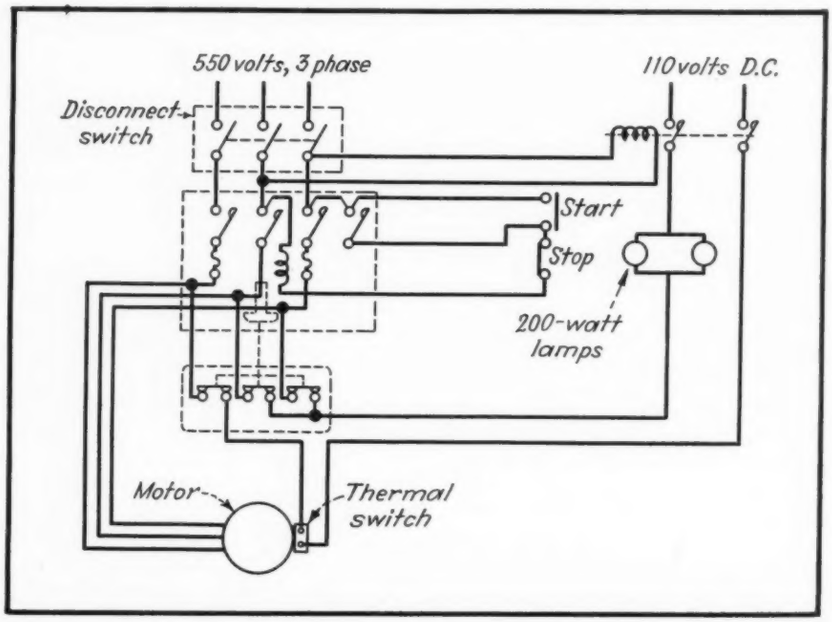
The illustration at the right shows the method devised to cut the coasting time of a recently purchased hole grinder.

In order to advance the delivery date two months the grinder was accepted without a brake on the spindle drive. It was hoped that the coasting time would not be objectionably long. Actually the machine coasted 9 seconds, which was much longer than desirable.

It was decided to apply direct current to the grinder motor, to bring it to rest more quickly. Since two voltages would then be in the same enclosure it was desirable to provide means for cutting out both voltages. A simple way of doing this involved putting a 550-volt relay across two legs on the load side of the disconnect. This relay closes both legs of the d.c. feed.

As will be seen, when the starter is closed 550 volts, a.c. is impressed on the motor and the second, normally closed relay that controls the application of the direct current is open. When the starter has been opened to stop the motor, the relay contacts are closed and 115 volts d.c. is put on the motor winding.

To keep the direct current down to a



EXIDE-IRONCLAD POWER PROVIDES THE THREE "HIGHS" THAT ASSURE FULL SHIFT AVAILABILITY

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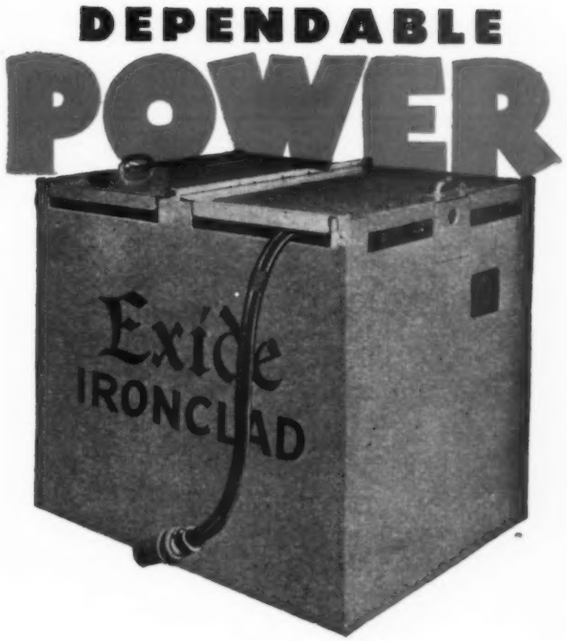
These—with Exide dependability, long-life, ease of maintenance and safety—assure "full shift availability," plus the increased tonnage and greater economy that result.

Write us for a FREE copy of the bulletin "Unit Loads" prepared by The Electric Industrial Truck Association. It tells how to cut handling costs up to 50% . . . covers latest developments in materials handling . . . and includes actual case histories.



THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • *Exide Batteries of Canada, Limited, Toronto*

reasonable value, two 200-watt lamps were connected in parallel and put in series with the motor.

In addition, a thermal switch was mounted on the motor. This switch will open if the motor reaches an excessive temperature. It was cut in on the d.c. side, because this current is about 3½ times the full-load motor current, and could cause undesirable heating. Also, if the operator should leave his machine for a long period of time without opening the disconnect, the motor would be protected by the thermal switch.

This arrangement makes an excellent brake for our purpose and has cut the former coasting time in half. It is useful, also, in holding the spindle in position when the operator is plugging for a hole.

The arrangement shown here is suitable, of course, only for a light-inertia load.

WEEPING HOLES IN FLOOR DRAIN OFF EXCESS WATER

H. E. WENRICH, Berwick, Pa.

After replacing a maple floor with concrete, it was discovered that no provision had been made for draining off excess water. Walls were of concrete block construction with glass block windows. When the humidity was 65 percent, condensation allowed water to drip down the walls and onto the floor, where it spread over into work aisles and created a deplorable condition.

The method finally worked out to overcome this condition was to place weeping holes every 20 feet around the building. A ½-in. shallow trough, 1 inch wide, was cut into the concrete flooring flush with the wall, around the entire area. Holes were drilled through on a slant, using a star drill for ½-in. pipes that were firmly mortared in.

Excess water now drains off to the outside, where the earth takes care of it without leaving puddles.

Three-way drop cords and wall outlets, with the third wire acting as a ground, serve to eliminate severe shocks which formerly resulted when metal dust or chips got into the housing of electrical appliances or tools, making electrical continuity. Since the system was installed at Cessna Aircraft Company, Wichita, Kan., time lost from electrical shock has been drastically reduced, and workers can handle their tools confident "they won't bite."

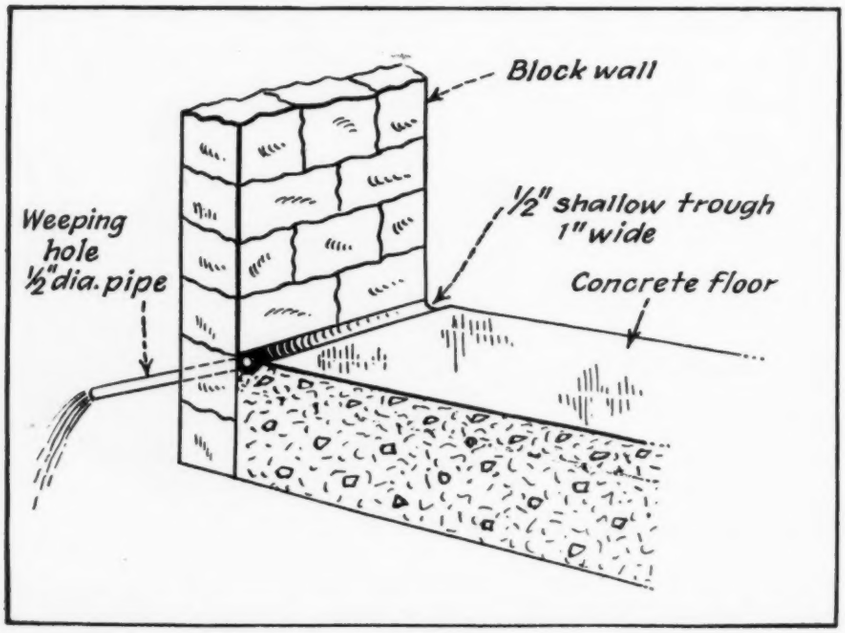
REDUCING WATER DAMAGE FROM SPRINKLER SYSTEMS

RICHARD DILWORTH, Engineer, Lorraine Manufacturing Company, Pawtucket, R. I.

Danger of damage to buildings and to materials in process from the breakage or premature opening of fire-protection sprinkler heads can be reduced by the simple plan described here.

Number the indicator control valves and corresponding risers and main feeder lines running through the building with luminous paint. Post under glass in each department or room a copy of the valve inspection report, underlining the valve that controls the system there. Then instruct at least two responsible men in the department on the location and operation of the control valve.

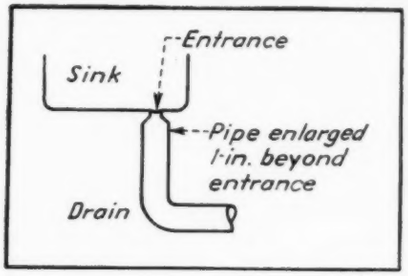
Now if anything should cause a sprinkler head to open, the water can be shut off promptly, the plant engineer can be notified without undue loss of time, and confusion trying to locate the proper person in the maintenance department can be eliminated. As a sprinkler head delivers about 42 g.p.m. at 100-lb. pressure, every minute saved in shutting off the system results in just that much less water damage.



LARGER PIPE REDUCES PLUGGING OF DRAIN

E. V. LEWIS, Assistant Plant Engineer, American Optical Company, Southbridge, Mass.

In the grinding room there are a large number of drains that formerly often became plugged. Sponges and rags are used in the operations conducted here, which frequently became lodged in a joint or elbow. If a piece of sponge was caught in the top of the drain and could not be reached with the fingers, the back end of a mop handle might be used to dislodge it. If the handle broke off in the drain, as used to happen, the maintenance department received a trouble call, and the plumbers had the messy job of unplugging the drain."



All sorts of screens and strainers were tried, but none ever lasted very long. Then someone thought of increasing the size of the pipe right after the entrance to the drain, as shown in the illustration. Anything that can get through the first inch of drain can surely get through the remainder of the pipe.

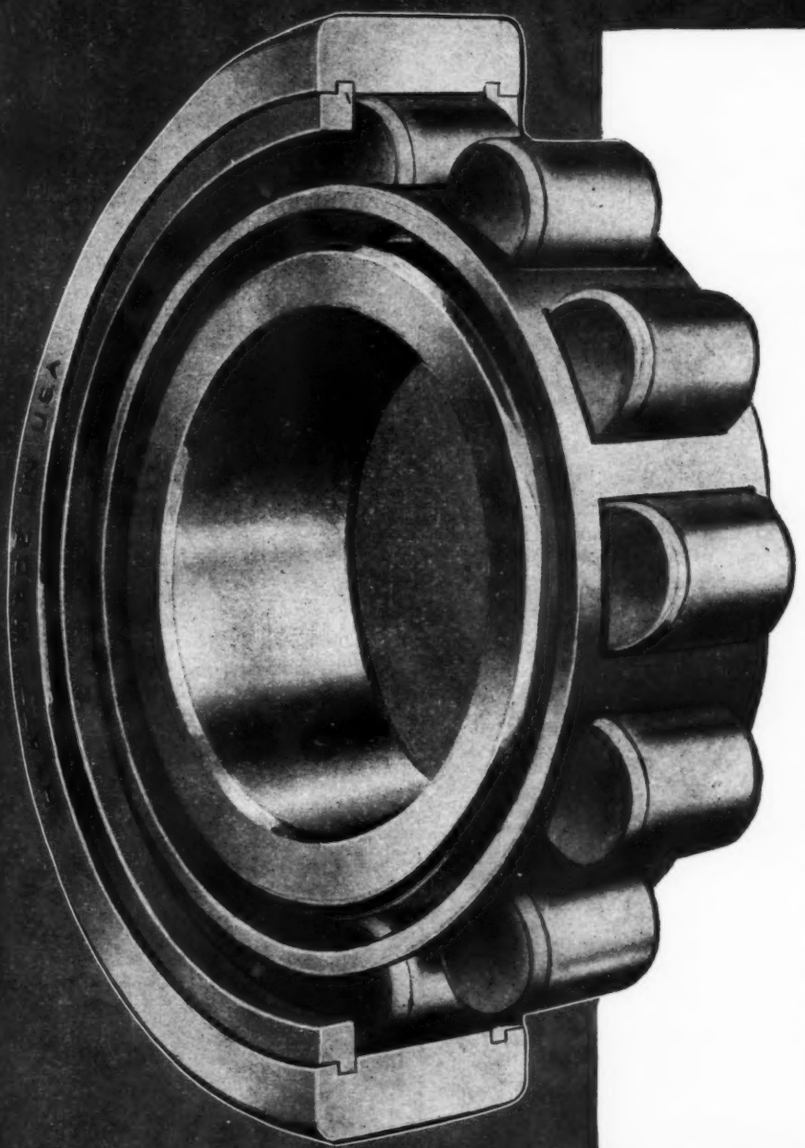
Since this change has been made, trouble calls have been cut in half.

FOOTBATHS FOR FACTORY WORKERS

A booklet titled "Amenities in Wartime Factories," published by the Department of Labour and National Service, Commonwealth of Australia, reports that footbaths for women factory workers have been found to reduce fatigue greatly, and to be particularly popular among women who

Rollers Roll—

IMPROVING MACHINE PERFORMANCE



FOR THE FIFTY-FOURTH YEAR Hyatt Roller Bearings go rolling along—carrying loads—reducing friction — enabling machines to do their jobs better—and at less cost for power and maintenance.

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Hyatt Bearings have won the confidence and earned the preference in many fields—mills and factories—farms—railroads — highways — everywhere. ★

Hyatt engineering service with its vast experience as bearing specialists is at your service—write us. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.; Chicago; Detroit; Pittsburgh; Oakland, California.

HYATT ROLLER BEARINGS

stand at their work all day, particularly since the stocking shortage.

Regular washroom sinks set at floor level, with benches or seats installed in convenient locations, are found satisfactory for this purpose. Another type is the white-tiled wash trough, set into the floor, with a slight rise in the trough between each spray, so that the water flows directly into the drain without overflowing into the adjacent basin.

Sprays furnish both warm and cold water, the warm water not lower than 100 nor higher than 140 deg. F. to prevent scalding.

WRECKING CONCRETE IN CLOSE QUARTERS

H. B. McDERMID, Cincinnati, Ohio

Concrete piers in close quarters can be broken in two for easy handling by a quick and simple wedging procedure. Horizontal holes about 2½ inches in diameter and 12 inches deep are drilled in the center of all four sides of the pier. Iron wedges are placed in the holes, with their flat sides on top and bottom, and resting against the flat sides of half-round iron shims. Walking around the pier and tightening the wedges in turn with moderate blows of a sledge will burst the pier in two, if the power is applied steadily, a little at a time.

Removal of piers 12x3x3 feet in a hydro plant was a tough problem until they were broken in two by this method, when it became a comparatively easy matter to get them out with conventional cable slings and an overhead crane.

In another case, a U-shaped concrete machine foundation, perhaps 24-in. square in section, stood broken loose at the ground line, in three movable pieces, about 15 minutes after one man had drilled holes around the foundation and gone to work with shims, wedges, and a sledge.

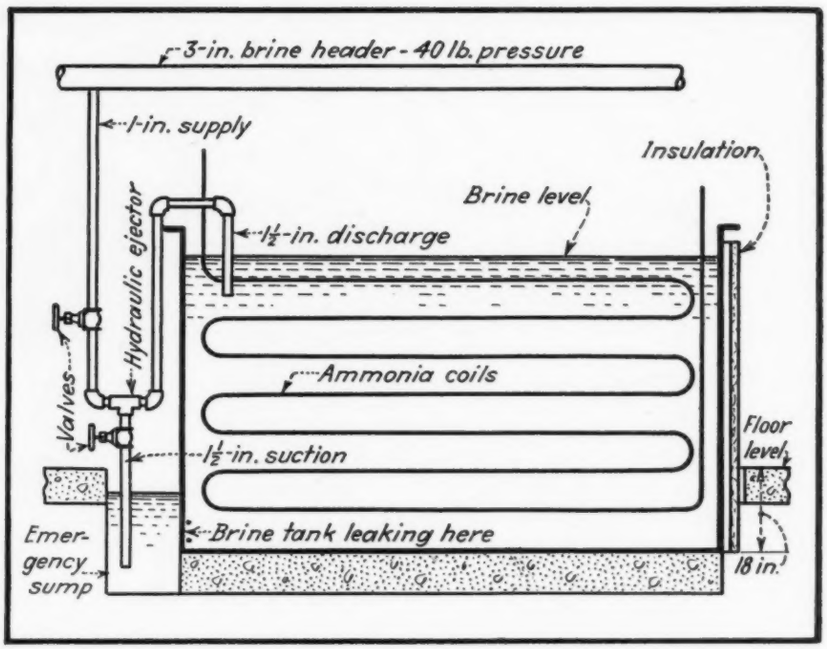
There is another demolition stunt that can often be worked in close quarters. Drill fairly large holes in the concrete, or even in softer rocks, and fill them with soft dry wood by driving it in as tight as possible. Then hang a bucket of water over the wooden wedges, with a small hole in it, so arranged that the water soaks into the dry wood. Leave it over night, and the expansion of the wood will have cracked the concrete neatly, with no danger to nearby surroundings, which might have been ruined by explosives. Proper layout of the holes will control the action.

"SHARE THE RIDE" PLAN SOLVES TRAVEL PROBLEM

Failure of delivery of replacements parts and new buses in the Rochester area has resulted in transportation congestion almost as serious as during the most hectic war days. In an attempt to overcome this condition, the employees of Bausch & Lomb Optical Company have organized a new "Share the Ride Plan."

Information concerning all employees, names, where they live (by ward), whether they own and drive a car, or wish to find a ride, and hours of work, is all recorded on tabulating cards. These are filed territorially, then divided as to drivers and riders, thus providing a working directory by which the two groups can be coordinated.

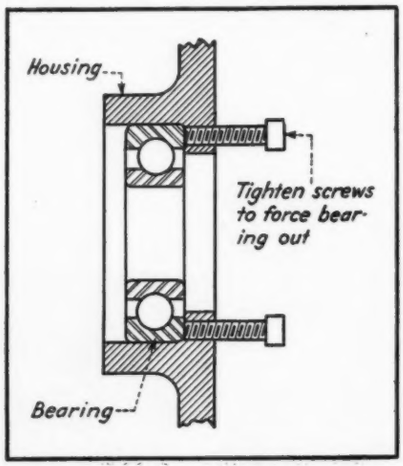
Windshield cards, inscribed "Going to Bausch & Lomb—Hop In," are provided by the transportation desk in the industrial relations department, and all employees are urged to apply the Golden Rule in the use of their cars.



SCREWS IN HOUSING PUSH BEARING OUT

RONALD EYRICH, Milwaukee

The difficult task of removing an antifriction bearing that has been pressed into a housing can be simplified by a little forethought. If two tapped holes are provided



as shown in the drawing, the bearing can be removed easily and without damaging it, simply by advancing the cap screws.

EMERGENCY SUMP KEEPS LEAKING TANK GOING

FRANK COWAN, Chief Engineer, Arnold Brothers, Inc., Perry, Iowa

When a serious leak was discovered in the bottom of a 20-year-old brine tank, exposing several ammonia refrigeration coils, an investigation showed that satisfactory repair could be made only by emptying the tank. This would have involved not only removal of the tank from service, but also curtailment of our entire operations.

The brine tank, which is located in a concrete pit foundation 18 inches below the floor level, was apparently leaking at the bottom and for a short distance up along the vertical seam in one corner. As a result, the brine was seeping up to the floor level between the tank insulation and the concrete pit sidewalls, and escaping in noticeable quantity over the floor.

An ingenious solution to our predicament ment was found in the construction of a sanitary sump at the point of leakage to collect the escaping brine, and in the installation of a hydraulic ejector, "powered" from the brine header, to return the recovered brine from the sump to the tank. The sump was dug below the tank foundation level, and was lined with wood to keep the brine clean. The ejector supply was connected by a 1-in. valved line to a convenient outlet in the brine header, which is maintained at 40-lb. pressure by the pumping system for delivery of brine from the tank to the spray decks. The ejector suction and discharge lines, both 1½ inch in size, were carried down to the sump, and up the side and over the top of the tank, respectively. A valve was also placed in the suction line.

This set-up provided throttling control that consumed very little pressure from the brine header, and enabled the return of all leaking brine to the tank with no change in its density or in temperature.

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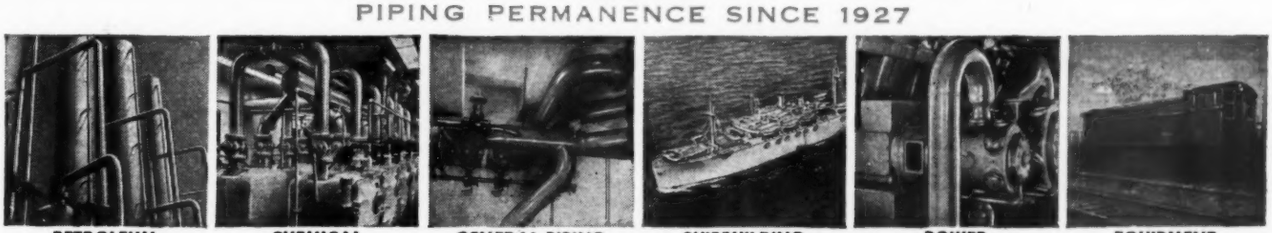
PIPING PERMANENCE SINCE 1927

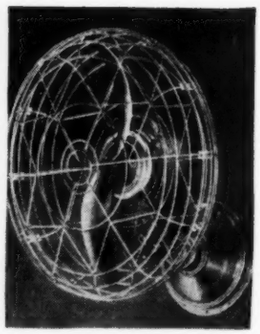


PETROLEUM | CHEMICAL | GENERAL PIPING | SHIPBUILDING | POWER | EQUIPMENT

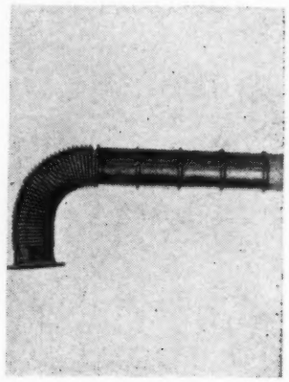
heating, ventilating, and air conditioning equipment

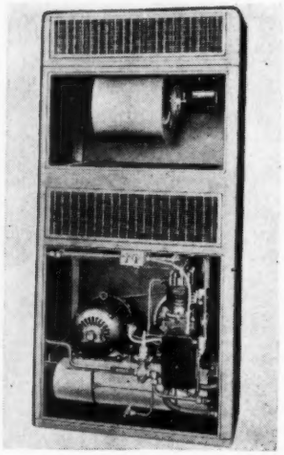
Heating, ventilating, and air conditioning equipment introduced to you by FACTORY during the past 10 months is reviewed here to give you a quick summary

AIR CIRCULATORS—consist of Models 14R, 17R, 20R, 23, 26, and 35, the number indicating propeller size. The low stand fan swivels to become a wall mounting if desired. Addition of sub-base and telescopic tubing converts low stand fan into high stand unit, which adjusts from window to ceiling heights. Fresh'nd-Aire Company, Chicago.



AIR DUCT—Glass cloth and rubber make up Airtron duct for hot or cold air. Insulated and flexible, preventing fatigue cracks from vibration, it is claimed to withstand temperatures from minus 60 to plus 300 deg. F., and 50 p.s.i. internal pressure and to be unaffected by air, light, water, gasoline, oil. Arrowhead Rubber Company, Los Angeles.

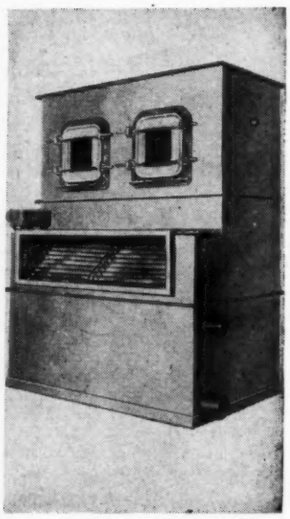




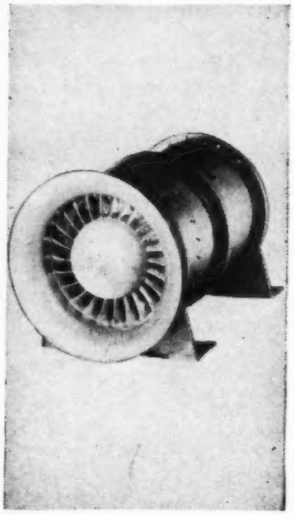
AIR CONDITIONER—is for cooling industrial offices and for process temperature-humidity control. Contains copper-aluminum coils, wet-zone removable filters, multivane fan with adjustable V-belt drive, frontal control panel, thermostat in return-air stream, two-way adjustable discharge grill, heating coil, and three-phase, 60-cycle, 220-volt compressor motor, with magnetic starter. Available in 3- and 5-ton capacities. Refrigerating Machine Division, Curtis Manufacturing Company, St. Louis.

AIR FRESHENER—for enclosed spaces subjected to occupancy and industrial odors, is known as Evapatrol. When used in spaces equipped with air conditioning, whether a central or a packaged self-contained type, the unit consists of a reservoir of Airkem (chlorophyll air freshener), pump, regulator, and vaporizer. For non-conditioned spaces, a portable unit, mounted on casters, incorporates a motor-driven fan for circulation of the freshener. W. H. Wheeler, Inc., New York.

AIR CONDITIONING EQUIPMENT—System provides a means of dehumidifying-humidifying the air in quantities from 10,000 to 70,000 c.f.m., independently of temperature, for processing operations, and for personal comfort. Smaller package units from 1350 to 5000 c.f.m. and large central systems also are available. Some of the processing operations provide conditioned air as low as 19 degrees dew point, or about 6 percent relative humidity at 90 deg. F. Kathabar Division, Surface Combustion Corporation, Toledo.



COMPRESSORS, BLOWERS, FANS—have applications in heating, ventilating, and air conditioning fields requiring pressures up to 6 inches of water; dust removal, conveying, processing, drying, and forced draft blowers requiring 10 to 100 inches of water; and coke ovens, blast furnaces, and processing, requiring 3 to 100 p.s.i. Blower, delivers 8000-c.f.m. and 10-in. s.p., turning 3450 r.p.m. Pressure and efficiency characteristics are said to allow economical operation over a wide range. Noise level is low. Buffalo Turbine Corporation, Buffalo.



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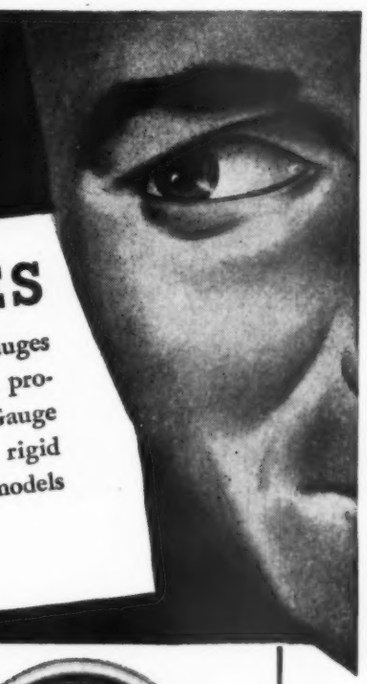
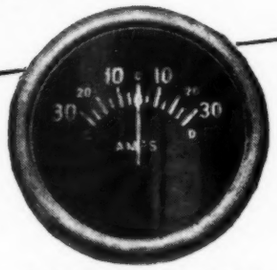
KEEP AN EYE ON EVERY ENGINE WITH...



STEWART-WARNER GAUGES

All during the war, the major share of Stewart-Warner production of gauges was devoted to the needs for tanks, landing boats, trucks and jeeps. Now, production is shifted to meet the needs of industry. Every Stewart-Warner Gauge is designed to withstand abuse yet conform in every way to the most rigid requirements for precision. Shown are just a few of the many types and models of Stewart-Warner Gauges.



STEWART-WARNER AMMETER

Model 690-B—Polarized vane type. Will withstand a 100% momentary overload shock without damage to mechanism or calibration. Magnets aged for 30 days to give stability over a long period of time. Case size, 2-19/32". Dial range—30-0-30. Also available in 2" size and in other ranges.

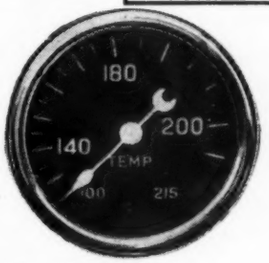
STEWART-WARNER OIL PRESSURE GAUGES

Stewart-Warner oil pressure gauges are ruggedly built to give maximum service under heavy duty conditions.

Model 94725—Segment dial type. Case size, 2". Dial range, 0-50 lbs.

Model 691-BB—Full dial type. Case size, 2-19/32". Dial range, 0-75 pounds.

Other ranges available in both sizes.



STEWART-WARNER WATER TEMPERATURE GAUGES

These gauges consist of a rugged bulb, tubing and instrument head assembly. They're built to "stand the gaff."

Model 95246—Case size—2". Dial range—100°-220°F.

Model 692-E—Case size—2-19/32". Dial range—100°-215°F.

Oil temperature gauges also available.

STEWART-WARNER VACUUM GAUGE

This precision-built gauge is outstanding for heavy duty.

Model 444106—Full dial. Case size, 2-19/32". A valuable aid in diagnosing various engine troubles. Furnishes indication of engine efficiency.

ALSO AVAILABLE! A full line of Stewart-Warner electrical gauges and complete instrument panels.

Another Product of STEWART WARNER

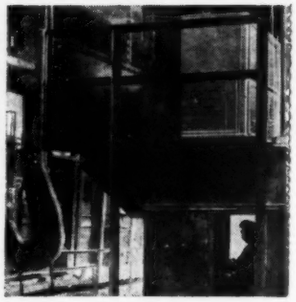
Write for Literature and Further Details

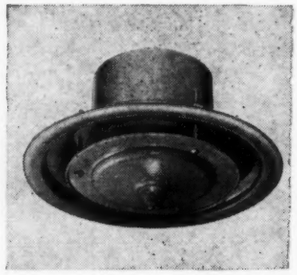
STEWART-WARNER CORPORATION

Instrument Division

1870 Diversey Parkway, Chicago 14, Illinois

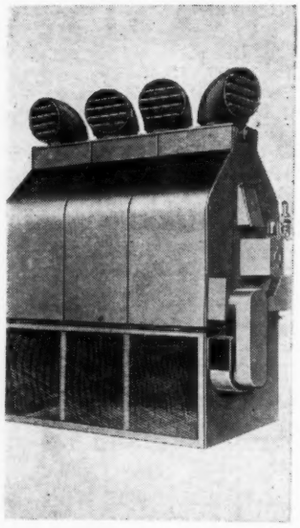
CRANE CAB COOLER — which is fitted to top of cab, is enclosed in steel frame and housing. Air supplied to the cab is cooled, cleaned, and constantly circulated, and dust as well as smoke is dissipated. Acid fumes are eliminated by fume absorber. Unit is designed to withstand the vibration inherent to heavy-duty crane operation. Dravo Corporation, Pittsburgh.

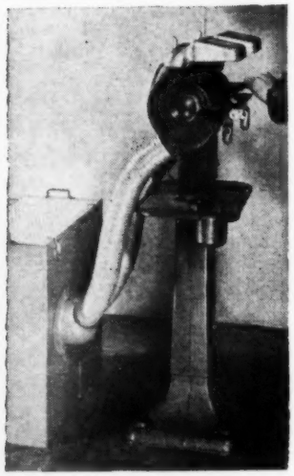




DIFFUSER – Design of the Type K Kno-Draft adjustable air diffuser has been modified to include a tamperproof cap at base of damper control screw. Cap can be removed with a Phillips-head screwdriver to provide access to the damper screw. W. B. Connor Engineering Corporation, New York.

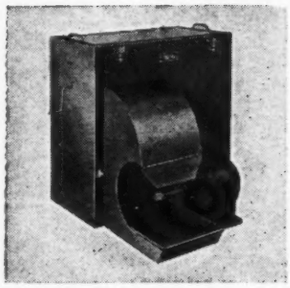
DIRECT-FIRED HEATERS— ranging in capacity from 75,000 to 2,000,000 B.t.u. output per hour, are suitable for oil, gas, and coal. Self-contained, the units are equipped with automatic control systems, and can be used either for air distribution direct through rotatable diffusers, or through ducts. Advantages claimed for the heaters are: low resistance, providing low motor horsepower; independent V-belt driven induced draft fan; and self-contained automatic thermostatically controlled humidification. Herbert H. Davis Company, Cicero, Ill.





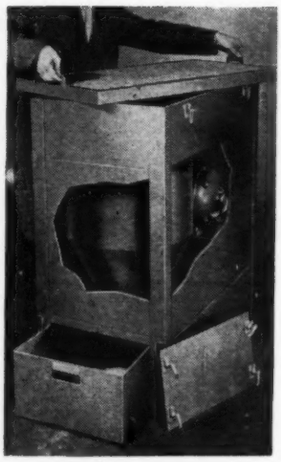
DUST COLLECTOR—is portable, for connection to grinders, sanders, abrasive disks, cutoffs, and polishing lathes. Of the recirculating type, Model 420 features a cyclone separator, motor-driven multiple blade fan, large dust storage bin, and flat spun glass filter, contained in single all-steel, fire-safe unit. Installation requires no tools. Power to provide suction is supplied by multiple blade fan driven by ¼-hp., 3450 r.p.m. motor. Aget-Detroit Company, Ann Arbor, Mich.

DUST COLLECTOR — requires no installation other than placing the unit in position and plugging into 110-volt supply. In hood are a removable sludge pan and a baffle to prevent small parts from being drawn into the collector. Cyclone separator removes heavier dust and dirt, and fire-resistant spun glass filter removes finer particles. Aget-Detroit Company, Ann Arbor, Mich.



DUST COLLECTOR—Belted motor-driven Air-Rester is used for collecting dust from grinding, buffing, and polishing machines. Designed for 25-cycle current, it also is available for 60 cycles. Model AR-14B has a ¾-hp. motor, 450-c.f.m. capacity. The AR-24B has 1½ hp. motor with capacity of 1000 c.f.m. Lower compartment contains suction fan with motor; dust collecting chamber is located on top of stand. Chamber is fitted with filtering pads for arresting dust and allowing the dust-free exhausted air to leave at low velocity. The Standard Electrical Tool Company, Cincinnati.

DUST COLLECTOR—features pressureless build-up to provide continuous equal suction at throat of hoods. Fan unit of high static pressure type overcomes resistance of collector unit and develops 2-in. w.g. or more at throat of coupled hood. Equipment has two precipitating elements. One is specially designed for coarse dust. The other is intended for use where fine dust is present. Where extra-fine (hazardous but non-explosive) dust is encountered, an electrical secondary, operating from a lighting circuit, may be added. Aerotec Company, White Plains, N. Y.

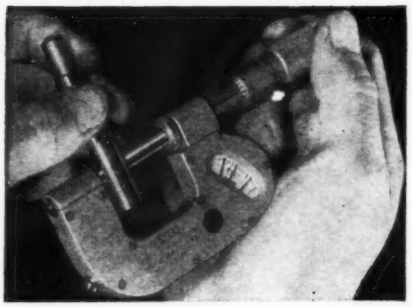


DUST REMOVER—Designed for individual use on large wheel dry grinders, disk grinders, sanders, and polishing and buffing equipment, Model 1150 Dustkop dust collector also is adaptable for use on more than two wheels when they are small and grouped close together. It has a thick flat filter of spun glass. Of the unit type, no ductwork is required. Connection between dust outlets and collector can be made with metal hose or sheet metal pipe. Aget-Detroit Co., Ann Arbor, Mich.

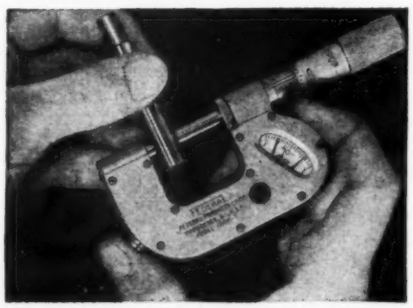
CONTINUED ON PAGE 164

THE MICROMETER YOU HAVE BEEN WAITING FOR

THE FEDERAL INDICATING MICROMETER



USED AS A MICROMETER — spindle is brought into contact until Indicator reads "O".



USED AS A GAGE — push button retracts anvil and dimension is checked on dial.

. . . Has Many Advantages Over Usual Type Micrometers

This new Federal Indicating Micrometer combines the precision of the Dial Indicator for uniformity of contact pressure and for use as a comparator, with the accuracy of the micrometer thread for measuring.

You do not need the skill of a toolmaker to operate it accurately. The Dial Indicator insures uniform contact pressure.

It takes the place of a complete set of "go and no-go" gages, because you can set it to the required size, clamp it in that position, and gage your batch of workpieces.

Anvil is retractable. Both contacts are Tungsten Carbide tipped.

It is light, easy to handle, and much easier to read.

Write for descriptive folder to —

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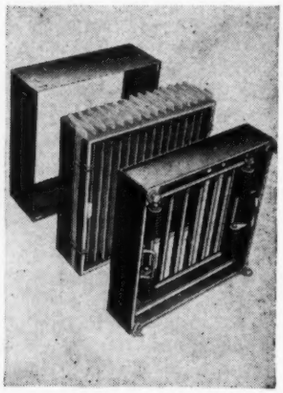
1144 EDDY ST., PROVIDENCE 1, R. I.

Color Films Available No. 1 Dial Indicators. No. 2 Dial Indicator Gages. For instruction and training. Loaned on request.

FEDERAL MECHANICAL AIR and ELECTRONIC GAGES

PRECISION MEASURING INSTRUMENTS

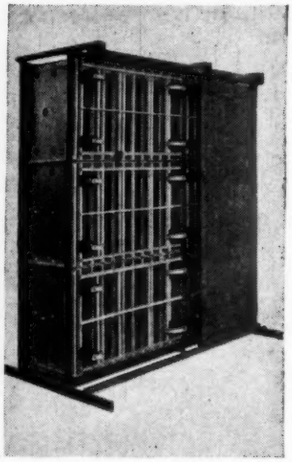


ELECTROSTATIC AIR FILTER — Known as Electro-Airmat, air filter features collector element of electrostatically charged Airmat paper. Said to have arrestance rating of 90 percent or better, with atmospheric dust or smoke, at the normal velocity of 35 f.p.m., through the Airmat media, and standard rating of 1000 c.f.m., standard-sized 24x24-in. unit. Power pack operates on a 110-volt, 60-cycle single-phase current. American Air Filter Company, Louisville.

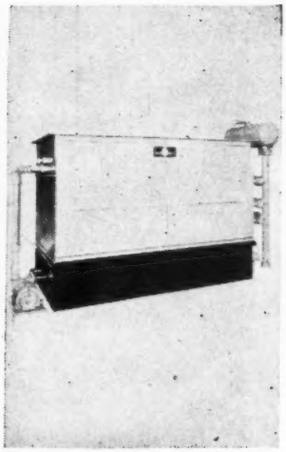
HUMIDIFIERS—utilize a venturi nozzle to discharge steam. One of the models has a solenoid valve to control the discharge of steam automatically, the other has a hand-operated valve. Fast steam discharge through the venturi effects thorough mixing with the air. Venturi replaces electric fan and motor previously used, simplifying maintenance. Elimination of the motor also reduces the electrical load. Armstrong Machine Works, Three Rivers, Mich.

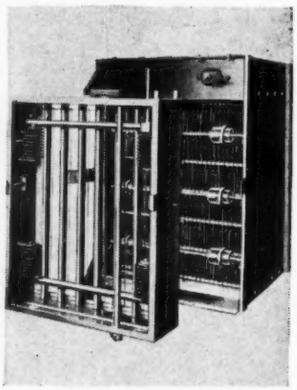
LIGHTWEIGHT DUCT—Portovent is a metal-reinforced lightweight large-diameter duct, which can be compressed into small space for transportation. It is suited for use with portable manhole and tank ventilators, as well as with portable air conditioning, heating, and cooling units. Has sectional construction, allowing assembly of any length from 2½-ft. sections. Can be coupled and uncoupled by hand. American Ventilating Hose Company, New York.

ELECTROSTATIC DUST REMOVER—is said to remove 90 percent or more of all airborne dirt by electrostatic precipitation, when installed in ductwork systems of industrial air circulating and air conditioning equipment. Used also to remove smoke, dust, pollen, and oil mist, unit consists of three principal parts — dust-collector cell, ionizer, and power supply. Smallest unit, handling 1200 c.f.m., is said to be sufficient to clean a room 35x35x12 feet. Raytheon Manufacturing Company, Waltham, Mass.

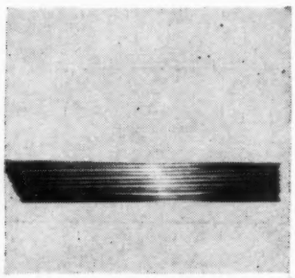


LIQUID COOLER—Furnishing refrigerated cooling water or any aqueous solution for industrial uses, equipment cools water to lowest possible temperature above freezing for air conditioning of water cooling jackets, or in chemical, photographic, and industrial processes. It is said possible to produce 33-deg. water constantly without danger of damage from freezing. Range of capacities in different sizes runs from 4.7 to 137 tons refrigeration. Niagara Blower Company, New York.



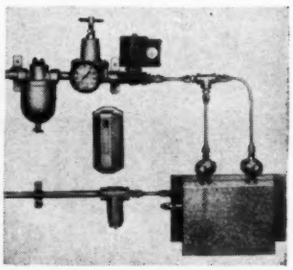


ELECTROSTATIC FILTER — Unit-type electrostatic air filter with removable collector plate assemblies is manufactured in a range of sizes which can be combined to provide any multiple of the capacities of the basic units. Standard sections of the filter are 2 and 3 feet in width with an approximate capacity of 1000 and 1500 c.f.m. per unit, respectively, at 90 percent efficiency, maker says. American Air Filter Company, Louisville 8.



TURNING VANES—Electric heat is added to air flowing through ducts by means of copper turning vanes installed at corners. Manufacturer states that the vanes reduce normal pressure loss resulting from air crowding into duct corners, thereby increasing volume output without altering blower set-up. Known as Turvanes, units have heating capacities ranging from 15,000 to 1,240,000 B.t.u. per hour. Designed for use in ducts where air velocity is between 1500 and 3500 f.p.m. Industrial Chamberheat Laboratories, West Roxbury, Mass.

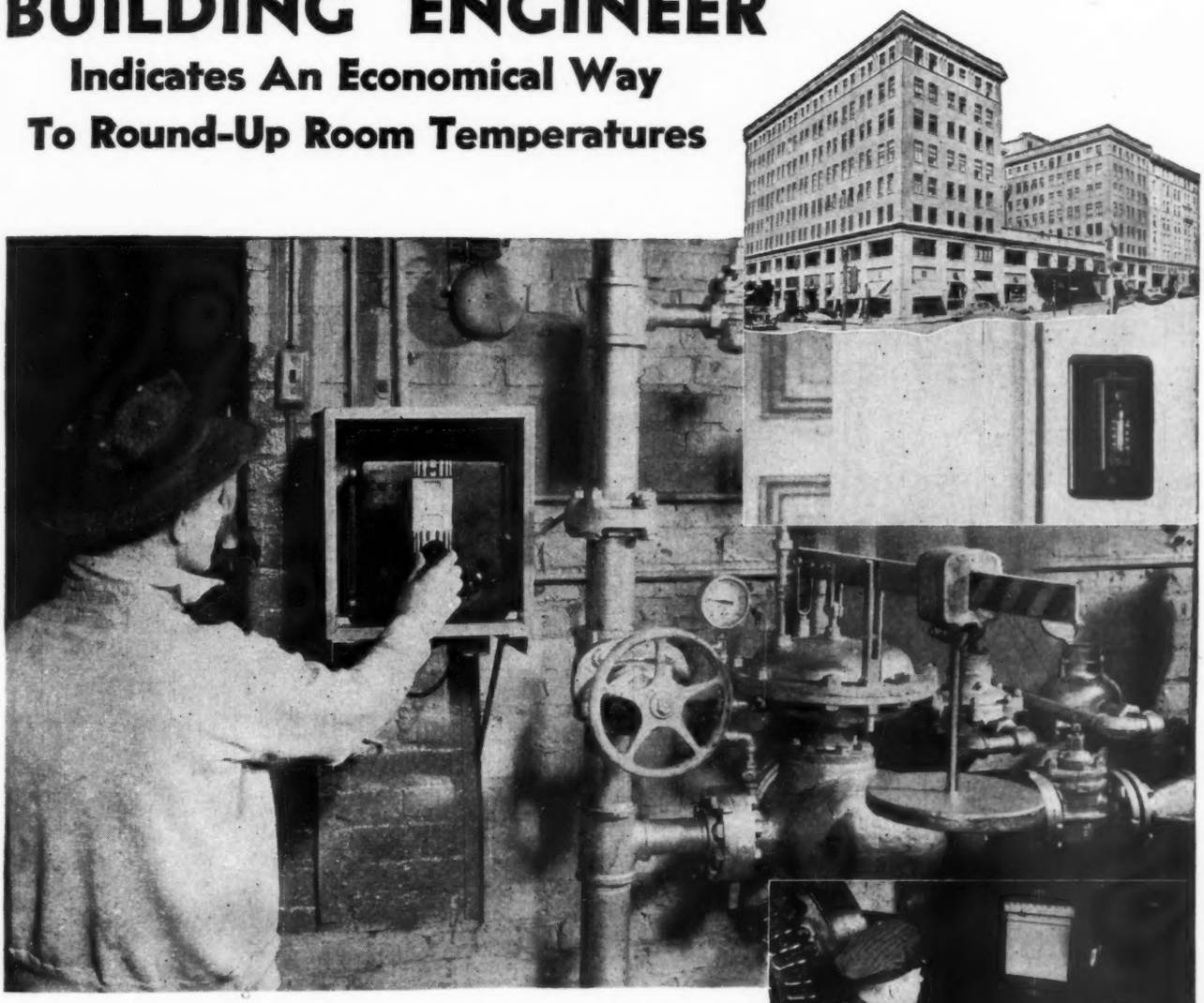
HUMIDIFYING UNIT—made in 2- or 4-nozzle assemblies, with humidistat control, produces a finely atomized spray. Nozzles can be set at different angles to increase efficiency of moisture distribution. A fine round spray is produced. Spraying Systems Co., Chicago.



VENTILATOR — designated Wolverine roof fan, is claimed to incur low installation and operating expense, to have positive ventilation results regardless of direc tion of wind currents, and to be adaptable to all types of roofs. The ventilator is manufactured in sizes ranging from 30 to 60 inches, with capacities from 5650 to 45,275 c.f.m. Installation of the unit entails fastening over rod opening and making electrical connections. It is possible to install ventilator on roofs with angles up to 45 degrees. Belanger Fan & Blower Company, Detroit.

BUILDING ENGINEER

Indicates An Economical Way To Round-Up Room Temperatures



Photos courtesy Warden Apartments

Recorder photo courtesy H. P. Wood & Sons, Boston

The man in the boiler room of the Warden Apartments, Fort Dodge, Iowa, reads temperatures throughout the building from an L&N Temperature Indicator . . . in turn served by sensitive Thermohms at the various locations.

His quickly-taken readings tell him exactly where more heat is needed, where less heat will do. He can do an efficient job of keeping the apartments at a consistently comfortable temperature, while using fuel wisely.

There are many applications for this step-saving, complaint-preventing instrument. Where more than an Indicator is needed, Micromax Recorders and Controllers can be supplied to show as many as 16 temperature points. If you'll describe your problem, an L&N engineer will gladly give his specific recommendation. Or we'll send Catalog N-33C, as you prefer.

Why This Is a PRACTICAL Help Toward Better Building Temperatures!

1. Indicator and Thermohms (detecting bulbs) are easy to install. No tubing required—just copper wire for 1½ volts.
2. Thermohms can be moved, repaired or replaced without affecting the instrument's calibration.
3. Indicator retains its accuracy. No calibrated springs or jeweled bearings—cleaning is the only attention needed.

LEEDS & NORTHRUP COMPANY, 4909 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

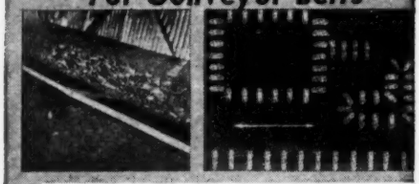
MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Jrl. AD N-33C-225(2)

Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

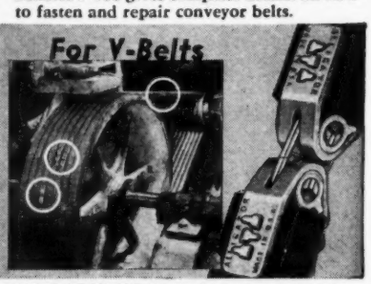
For Conveyor Belts



FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips and patches that can be made with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

For V-Belts



ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

For Transmission Belts

ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅜" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

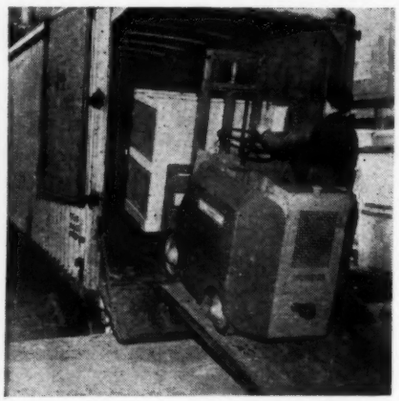
Sold by Supply Houses Everywhere

FLEXIBLE STEEL LACING COMPANY
4678 Lexington St., Chicago 44, Ill.

what's new in equipment

LIFT TRUCK

Model LT-35 lift truck has a side-mounted motor engineered to cut wheelbase length to 35 inches. Lifting and tilting mechanisms are hydraulic. Weighing 2800 pounds,



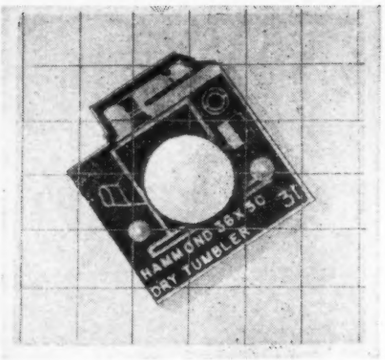
truck can lift, carry, and stack a 1500- or 2000-lb. load in tight aisleways, highway trucks, and freight cars. Can also operate on 2-ton capacity elevators as well as in multi-story buildings with low to medium load limits. Seat is protected from front and rear. Two wheels on steering axle permit short turning radius. Towmotor Corp., Cleveland.

GENERATOR

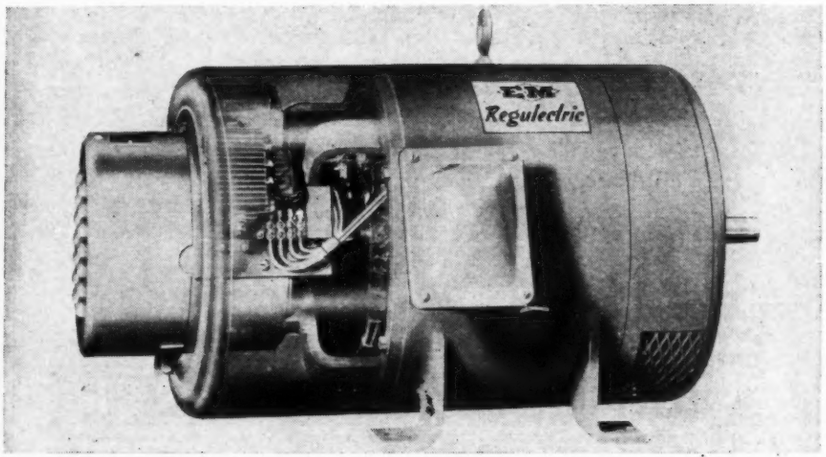
The principle of electrical resonance holds voltage constant in the Regulectric a.c. generator for use in engine generator sets. The built-in voltage regulating circuit needs no attention in operation to maintain voltage of power-line quality, since regulator has no moving parts and is factory-set to hold voltage within plus or minus 2 percent from no load to full load with normal engine speed regulation, manufacturer states. The generator is of the revolving-field type, and is built in following ratings: 5 and 7½ kw., 60-cycle, single-phase, and 7½ and 10 kw., 60-cycle, 3-phase at 1200 r.p.m.; 7½ and 10 kw. 60-cycle, single-phase, and 10 and 15 kw., 60-cycle, 3-phase at 1800 r.p.m. Electric Machinery Mfg. Co., Minneapolis 13.

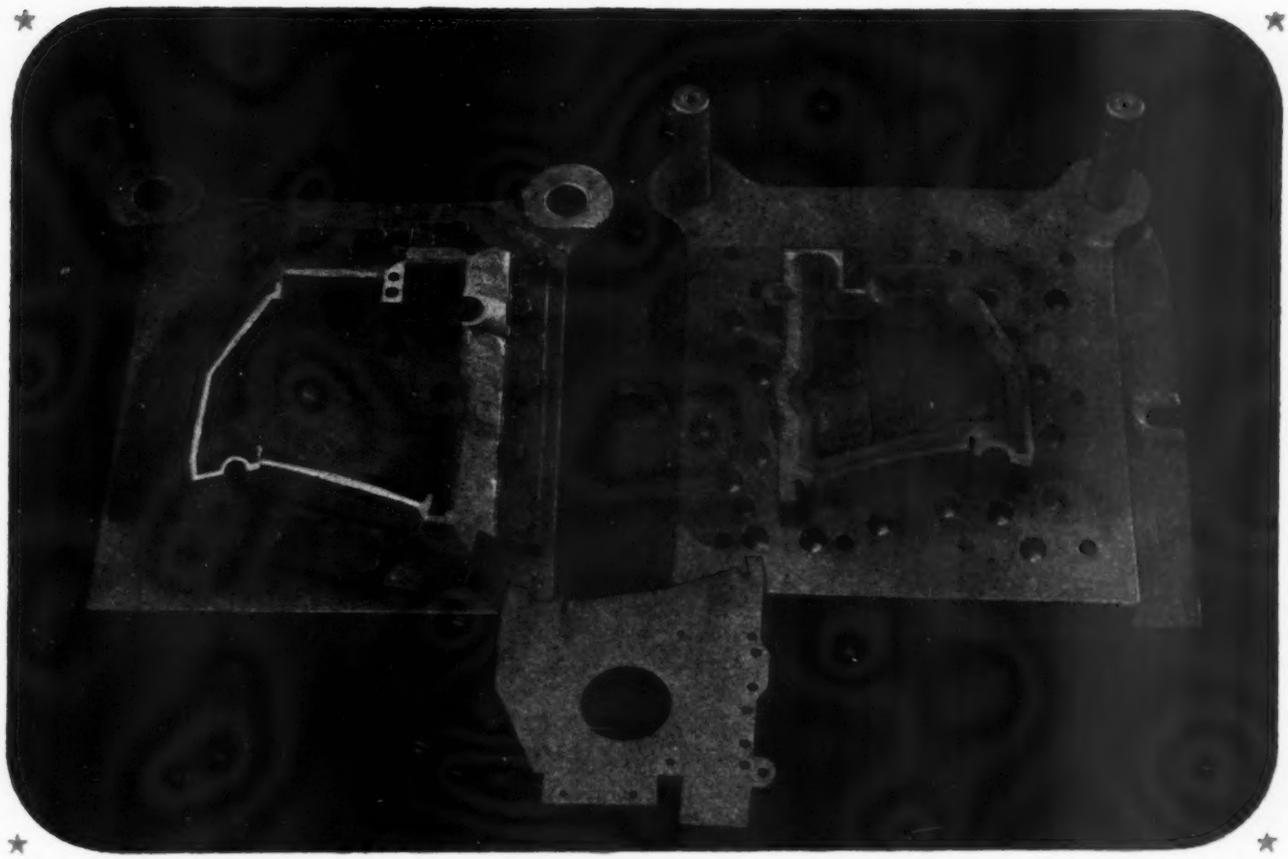
MAGNETIZED PLASTIC LAYOUTS

Plant layout system has been developed to eliminate need for stapling, tacking, or gumming templets, as well as for making



layout drawings. Made of emulsified sheet plastic with permanent magnet cores, templets are negative reproductions of equipment plan drawings. When placed on layout sheets of thin plastic with metal plate backing, they can be moved to any position on the mat, and remain where set. Details of machine number, name, location of base; services required, such as sewers, drains, air, gas, and water lines; manufacturer's name, model number; as well as building outlines can be shown. Prints are made by brief exposure of a dry process sensitized sheet which is inserted





HOW TO *Cut Costs and "Corners"* ON YOUR BLANKING DIES

You can save steel and time in the making of dies for blanking, trimming, beading, or any application involving the cutting of sheet metals to regular or irregular shapes, by assembling them from FCC Composite Steel Die Sections.

These prefabricated die parts consist of fine tool steel cutting edges, in a selection of grades, electrically welded by a special process to non-hardenable mild steel bases. Thus, screw and dowel holes may be easily drilled after heat treating, and there are numerous other advantages that will be immediately obvious to the die maker.

Thousands of die shapes may be made up from combinations of thirty-five standard sections. Specially shaped sections are manufactured to customers' specifications in five to ten days.

● Make *your* dies this money-saving way—full data on request.

WRITE FOR ENGINEERING DATA

It contains a print showing the various standard shapes available for quick shipment, and explains how to order special shapes, including rib-reinforced extra high sections. It also contains prices. Get your copy—write for it today.

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SAVED: 70% FASTENING COST

Holding the Hide on a Ball

A sporting goods manufacturer cuts his fastening cost 70% by holding baseball covers in place with Bostitch staples until the covers are sewed.

Many other Bostitch users enjoy similar savings: a tomato repacker makes up more than twice as many corrugated boxes per day; a candy maker saves 60% of his time in fastening box bottoms; a jewelry manufacturer attaches bracelets to cards in half the time.

Whatever *you* have to fasten . . . metal, plastics, wood, paper, leather . . . in any combination . . . the chances are that one of the 800 Bostitch machines can lower your costs or improve your product by fastening it better and faster with wire.

A corps of research engineers, and 250 field men in 91 key cities, make available to you the benefits of 50 years' Bostitch experience in solving fastening problems.

New Broadside 188 shows representative models of the 800 Bostitch stitchers, staplers, tackers, hammers . . . the world's most complete line. Write for a copy.

BOSTITCH

fastens it better AND FASTER *with wire*

ALL TYPES OF STAPLES APPLIED BY MACHINES
ALL TYPES OF MACHINES FOR APPLYING STAPLES

BOSTITCH (Boston Wire Stitcher Co.), 74 Blackmore Street, East Greenwich, R. I. (Bostitch-Canada, Ltd., Montreal).

Please send Broadside 188 on Bostitch time-and-money-saving machines to:

Name .....

Company .....

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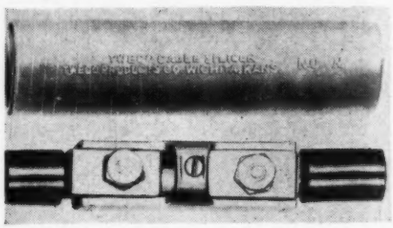
between the plastic sheet and the metal plate. Exposed sheet is developed over ammonia vaporizer. No darkroom is necessary. John Hill Layouts, Mt. Clemens, Mich.

WELDING CABLE SPLICER

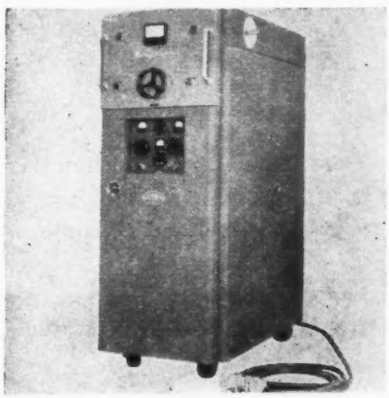
Line of welding cable splicers provides a quick repair of broken cables or salvaging short lengths. Simple clamp cable connection on each end of the splicer, with



provision to solder between cable ends provides a connection. A fiber sleeve covers the device. Made in three sizes to cover the range of welding cables—Size S for small No. 4, 2, or 1 cables; Size M for medium No. 1/0 or 2/0 cables; Size L for large 3/0 and 4/0 cables. Tweco Products Co., Wichita 1.

DIELECTRIC HEATER

Source of dielectric heat is called Raytherm. Said to generate heat directly within the part to be treated rather than to introduce heat through intermediate agent, thus effecting a marked saving in the time required for industrial drying and high

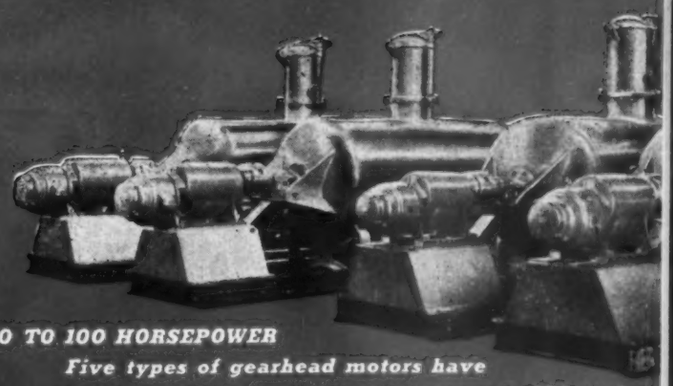


temperature processes. With 5 kw. output rating, general purpose Model D5G is complete in one cabinet with dimensions of less than 6x2½x4 feet. Maximum demand from a 230- or 460-volt, 3-phase, 60-cycle line is 13.3 kva. Range of frequencies covered is 1.7 to 13.6 megacycles. Industrial Electronics Div., Raytheon Manufacturing Co., Waltham 54, Mass.

PIPELINE STRAINER

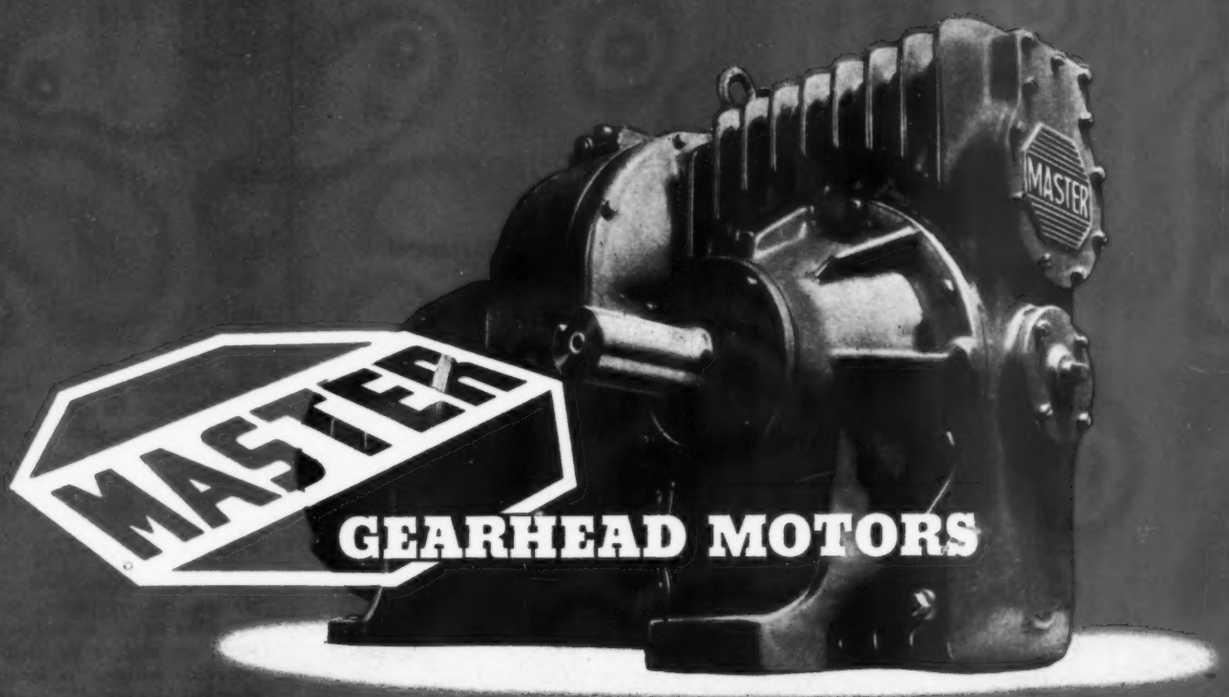
Duplex pipeline strainer is made with a transparent Lucite casing that permits visual inspection without disturbing strainer. For cleaning, flow can be diverted into the other chamber, without loss of pressure, and the filled chamber can be cleaned while pipeline maintains normal flow. Large open area capacities

You can secure Master Gearhead Motors for mounting in any position because anti-friction bearings and all-metal lubricant seals are used throughout.



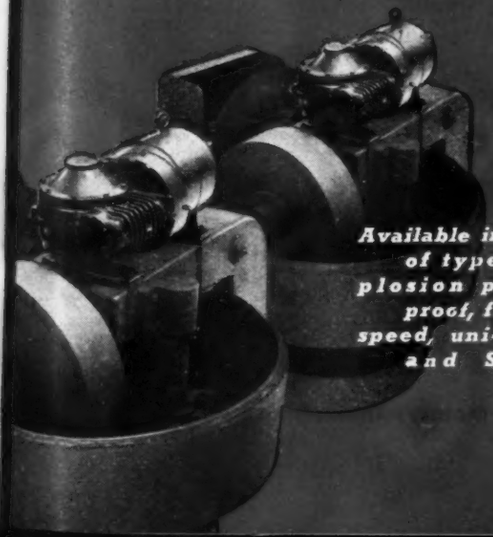
1/10 TO 100 HORSEPOWER

Five types of gearhead motors have reduction ratios ranging up to 432 to 1.



MASTER GEARHEAD MOTORS

THE MASTER ELECTRIC COMPANY · DAYTON, OHIO



Available in a wide range of types including explosion proof, splash proof, fan cooled, multi-speed, uni-brake motors and Speedrangers.

Save material and save space with simple, compact, integrally built Master gearhead motors.

• Step by step, through the process of converting nature's raw materials into delicate, sheer hosiery, moving air does many important jobs. Conveying materials, mixing chemicals, aerating and agitating liquids . . . all these are speeded by the simple act of blowing air.

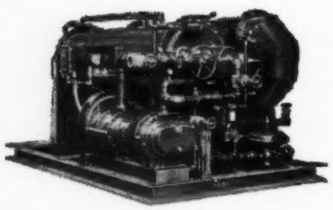
Much of this work is done by Roots-Connersville blowers. Not only for hosiery and other textiles, but in many chemical and synthetic processes, R-C units are depended upon to do their share for profitable production.

Even long before we dreamed of these modern materials, R-C blowers were used for:

Manufacturing explosives
Pneumatic tube systems
Coal treating
Priming centrifugal pumps
Water distillation
Vacuum filtration processes
Foundry cupolas
Testing toy balloons

R-C Inert Gas Generators have found wide application in chemical plants and other process industries where fire and explosion hazards must be economically controlled, such as mixers, ovens, dryers, grinders, pulverizers, and similar equipment, as well as processing uses. Ask for Bulletin 100-B-14.

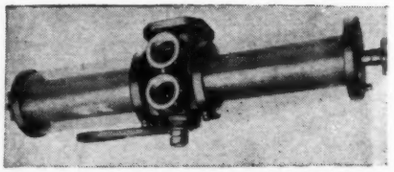
ROOTS-CONNERSVILLE BLOWER CORP.
One of the Dresser Industries
607 Central Ave., Connersville, Indiana



R-C Inert Gas Generators, gas or oil fired, are available in either stationary or portable types. Unit shown has a capacity of 35,000 CFH.

Roots CONNERSVILLE SINCE 1854

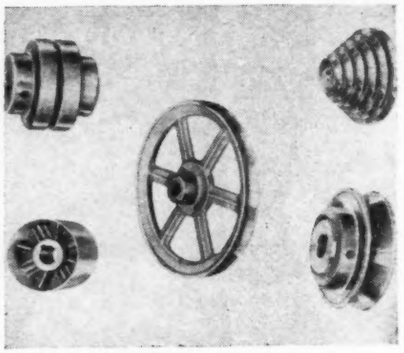
ROTARY POSITIVE AND CENTRIFUGAL BLOWERS • EXHAUSTERS • BOOSTERS
LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS



afford free movement of fluids throughout the unit; 16-1 ratio with 12-in. tubes, and 8-1 ratio with 8-in. tubes. Flat horizontal design permits low, close-quarter installations. J. A. Zurn Mfg. Co., Erie, Pa.

DRIVES

Line of drives, including V-groove, step cone, variable pitch and crown face pulleys, and flexible couplings, is announced. Pulleys are up to 16-in. diameter, and



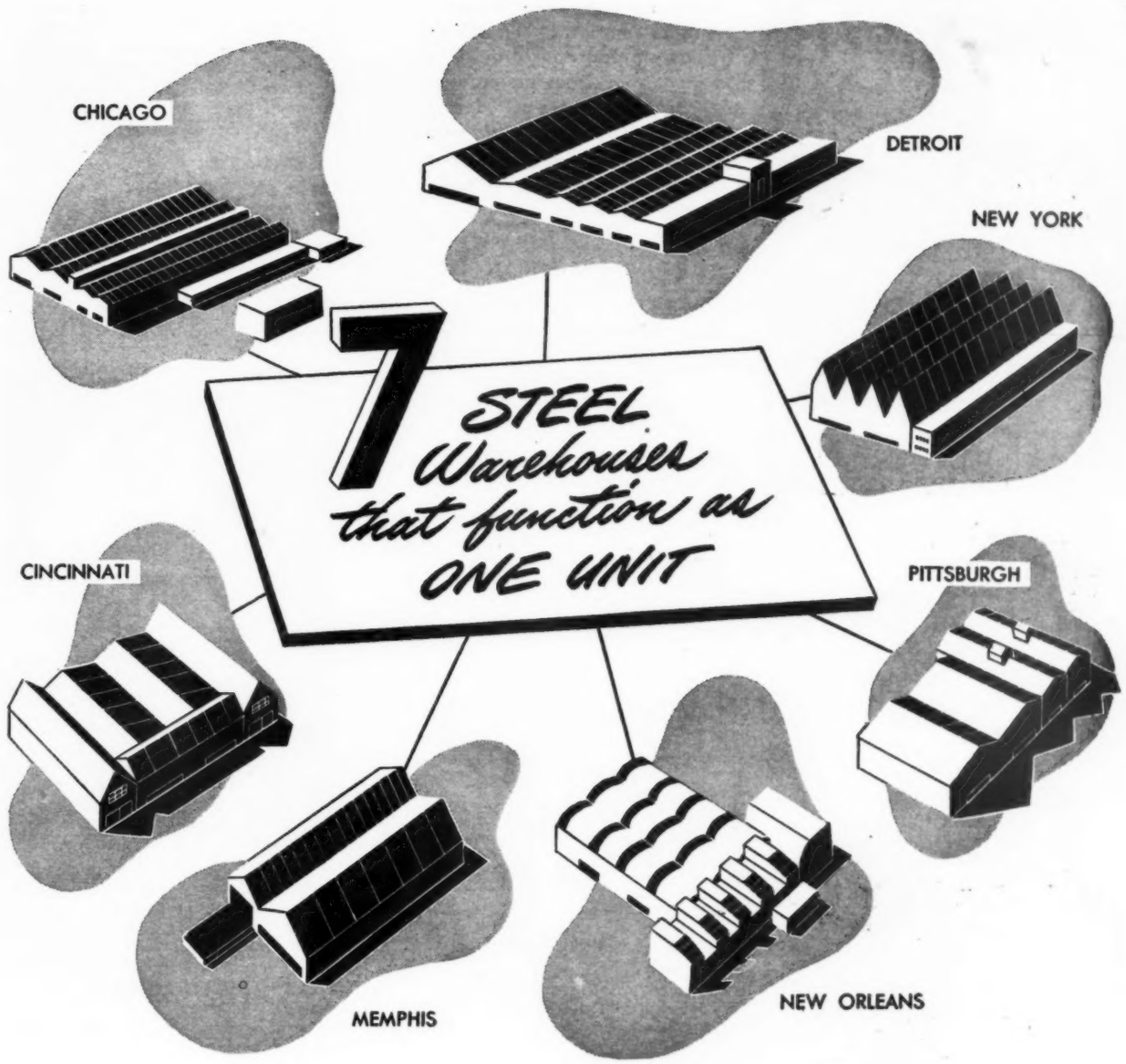
flexible couplings are for applications from 1/6 to 25 horsepower, with leather inserts for small couplings. Variable pitch pulleys, which allow up to 30 percent speed variation, are made in two pieces, one flange with the shaft housing, the second, or free flange, to screw in and out on the shaft housing to vary the pitch diameter. Congress Die Casting Div., Detroit 12.

METAL CLEANER

Tarnish, corrosion, and rust on brass, chrome, copper, monel, steel, aluminum, and other metals, as well as on enamel and cloth, are said to be easily and speedily removed, without rubbing, by Seabrite chemical cleaner. Maker states it will not injure paint, varnish, or plastics. Comes in 1½-lb. glass jars. Hudgins & Ratsey, 295 Fifth Ave., New York.

HAND TRUCK

Zephyr hand truck of cast magnesium alloy weighs 26.6 pounds, has no points or edges,



J&L Steel service warehouses with their ample stocks of J&L Controlled Quality Steel are strategically situated to serve you well. In addition your nearest J&L warehouse has the advantage of being able to call upon any of the other J&L warehouses to fill an unusual requirement for you. They can supply you with flame cut and fabricated steel and many exclusive J&L products such as Junior Beams, Junior Channels, Jal-Tread floor plate and J&L Precisionbilt Wire Rope.

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DETECTO offers a scale that cuts production time in half

Reconversion provides an opportunity at long last to re-evaluate your weighing operations — to check *all* your scales for accuracy, speed, and for ways of reducing operating costs. Whatever you weigh or checkweigh with the Detecto-Gram Speed Scale,

One operator does the work of two

The Detecto-Gram Speed Scale is built for lightning-fast-work, twice as fast as ordinary scales—having minimum indicator swing — short fall — end tower design — extra dial legibility. Truly a DETECTO product — super accurate, sensitive, precision built, sturdy, and long wearing. *Available for immediate delivery in aluminum.* Call a Detecto-Gram industrial weighing methods engineer and place your whole "reconversion-in-weighing" problem before him.

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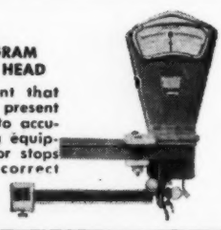
DETECTO-GRAM ALUMINUM SPEED SCALE FOR IMMEDIATE DELIVERY

 # 1800 DETECTO-GRAM INDICATOR HEAD

An attachment that converts your present beam scales to accurate weighing equipment. Indicator stops instantly at correct weight.



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MAKERS OF FINE SCALES SINCE 1900

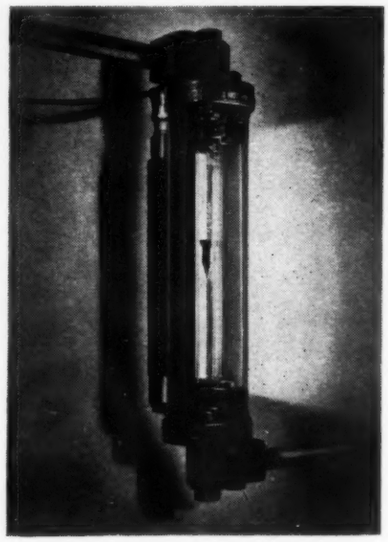
207 MAIN STREET • BROOKLYN 1, N. Y.

SCALE ENGINEERS IN ALL PRINCIPAL CITIES

and is claimed to be so balanced that, when unloaded, it automatically remains erect. Wheels are cast magnesium, equipped with ball bearings, and Zerk lubricated. Rubber wheel-tread is molded on. Nose is made of rust-proof steel. Magnelux Mfg. Co., 321 East Fourth St., Los Angeles 13.

ROTAMETER LIGHT

Lighting device for universal rotameter has a baked-enamel metal hood with narrow frontal openings. Fits against the back of the rotameter tube and directs a beam of light through the glass toward the operator, outlining rotor and meter scale



press and mold. Control is automatic. There is no starter button to push. The Girdler Corp., Thermex Div., Louisville.

BATTERY CHARGER

Rated at 8 amps., type SC-8 battery charger for 6-volt storage batteries delivers an initial charging current of from 10 to 12 amps., and automatically tapers to approximately 4 amps. at full charge. Operating on 110-volt, 50/60-cycle a.c., it can be connected directly to battery, or to ammeter terminals. Ammeter on face of selenium-plate charger indicates rate of charge and permits check on proper positive-negative connection to battery. Manu-

The "Place" type head is formed with a cup-like recess in its upper face and a circular recess in its under face adjacent to the shank. Between the radii of these recesses is formed a diaphragm (x) which acts as a spring element when the head is wrenched tightly against a rigid base.
U. S. Patent No. 1966044

SELF-LOCKING "PLACE" BOLTS BY "NATIONAL"

RESIST *vibration and fatigue*

This unique bolt with a "diaphragm" head design — making it elastic and self-locking — was developed for fastening tasks that must include plenty of vibration resistance.

The axial spring tension of the "Place" type bolt head, when tightened to the desired adjustment, has effectively met critical problems of fatigue and involuntary loosening on products of the automotive, aircraft, tractor and many other industries. Important examples—connecting rod bolts, main bearing cap screws, flywheel bolts and piston pin lock screws. These bolts may be used with nuts or in tapped holes but should be used only where it is possible to tighten against a rigid seat.

Place bolts are made of alloy steel, heat-treated to high physical properties. They can be furnished in standard cap screw or other bolt dimensions, as well as in special items for specific applications. Write us for detailed information and prices.

National HEADED AND THREADED PRODUCTS

OTHER "NATIONAL SCREW" SPECIALTIES INCLUDE:

Clutch Head Screws
Davis Blind Fasteners
Drake Lock Nuts
Dynamic Lock Nuts
Hi-Shear Rivet Pins & Collars
Huglock Nuts
Laminar Flow Screws
Lok-Thred Studs
Marsden Lock Nuts
Phillips Recessed Screws
Rosán Locking System
Screwlets—Sems

THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.

HAVE YOU FIGURED

Material handling?

PRODUCTION SKILLFULLY PLANNED, plant in tip-top shape, sources of supply secured —how about material handling—the vital factor in profit? Still using manual methods of yesteryear? *Use Clark Fork Trucks*—to lift, move and stack material. It's the time-saving, money-saving modern method, paced to the needs of current production.

Have a Tructractor Field Engineer study your needs—and engineer a plan to meet them.

CLARK

GAS and BATTERY POWERED FORK TRUCKS, PLATFORM TRUCKS, TOWING TRACTORS

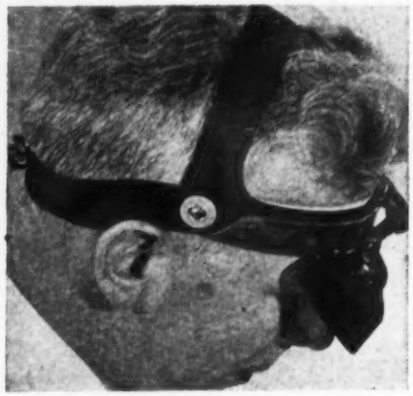
CLARK TRUCTRACTOR
Division of CLARK EQUIPMENT COMPANY
BATTLE CREEK, MICHIGAN
OTHER PLANTS — BUCHANAN, JACKSON, BERRIEN SPRINGS, MICHIGAN

Products of CLARK • TRANSMISSIONS • ELECTRIC STEEL CASTINGS AXLES FOR TRUCKS AND BUSES • AXLE HOUSINGS • BLIND RIVETS INDUSTRIAL TRUCKS AND TRACTORS • HIGH-SPEED DRILLS AND REAMERS METAL SPOKE WHEELS • GEARS AND FORGINGS • RAILWAY TRUCKS

facturer states it has no moving parts, no tubes, is noiseless, has unlimited life, and will withstand a 50 percent overload without harm. Mellaphone Corp., Rochester 2.

HEAD LOUPE

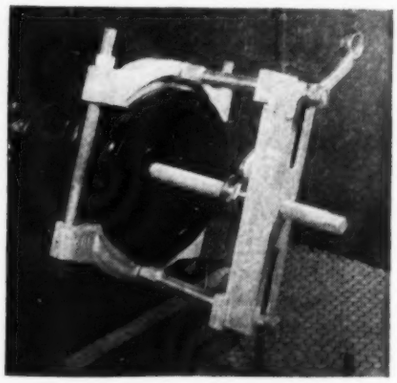
Flexible bracket mounting of Model 502 head loupe permits double-lens holder to be moved in or out, up or down. Loupe is designed for use in industries and pro-



fessions where depth perception (third dimension) with magnification is necessary. Back fiber headband fits the lower head snugly, and is adjustable. Lens holder acts as eye shade, can be pushed up. The Boyer-Campbell Co., 6540 St. Antoine St., Detroit.

SHEAVE PULLER

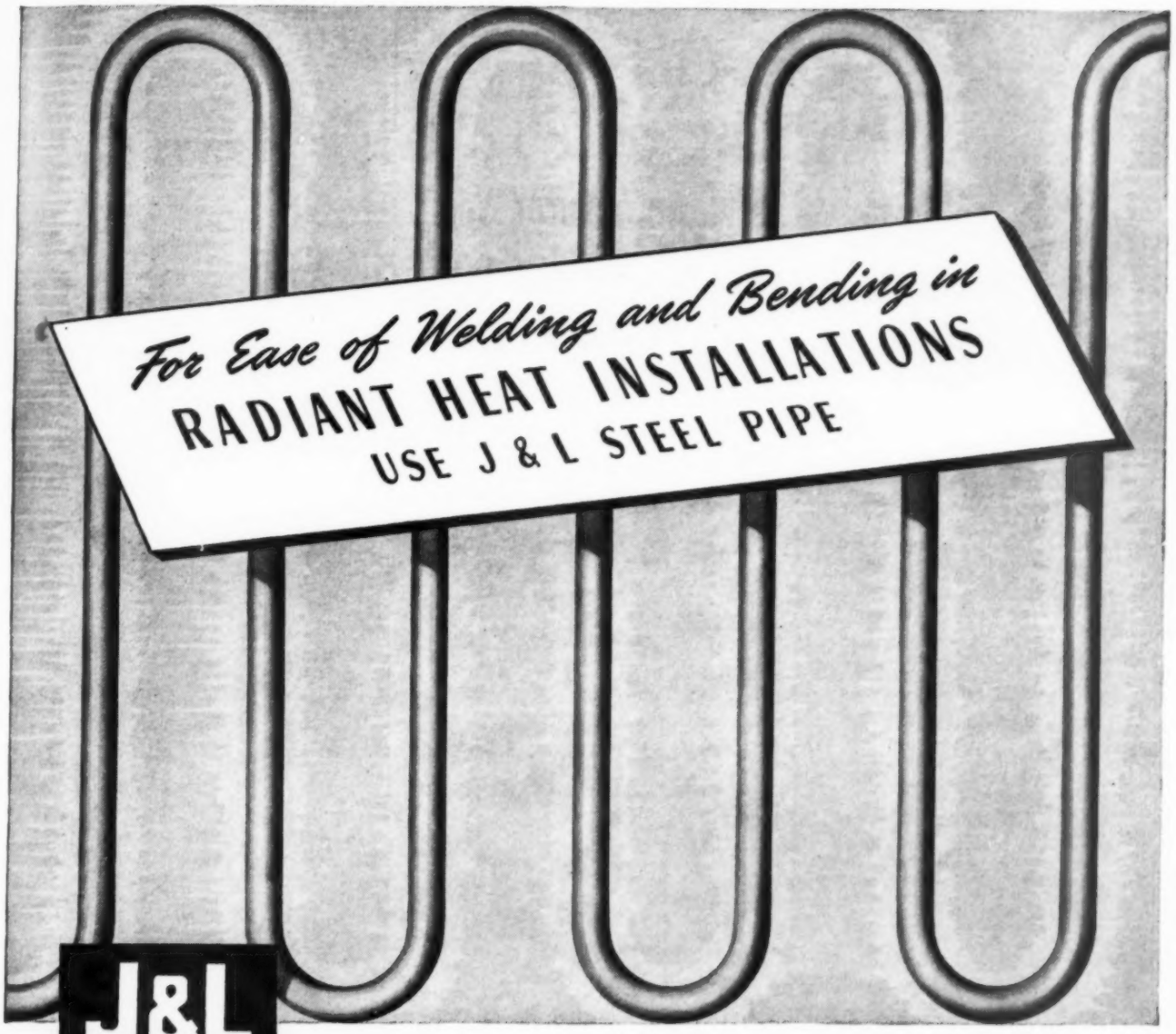
No. 679 sheave puller attachment can be used with Grip-o-matic or push-pullers. It simplifies the removal of both single and



multiple drive sheaves without distorting the sheave. It is clamped down in the V-groove, distributing the pulling strain evenly around a large part of the periphery of the sheave. Owatonna Tool Co., 363 Cedar St., Owatonna, Minn.

MOBILE ARC WELDER

Self-propelled arc welder, for maintenance welding operations, consists of a 300-amp. generator and tank carriers for oxy-acetylene welding. The door to tool chest in rear becomes a convenient welding and workbench when opened. A Chrysler industrial 6-cyl. engine furnishes power for welding and transportation. Special cable reel has capacity for 75 feet of both electrode and ground cable and is optional equipment. Current supplied to the reel



In installing radiant heating systems for homes and factories, J&L steel pipe has the ductility necessary to form readily. You can also weld it easily to obtain tight, leak-proof connections in the field. Use J&L steel pipe in your next radiant heating job and be sure that you are providing the best.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA

We Have Yet to Find the Manufacturer Who Cannot Benefit by the Principles of THE TURNER SYSTEM OF MATERIALS HANDLING

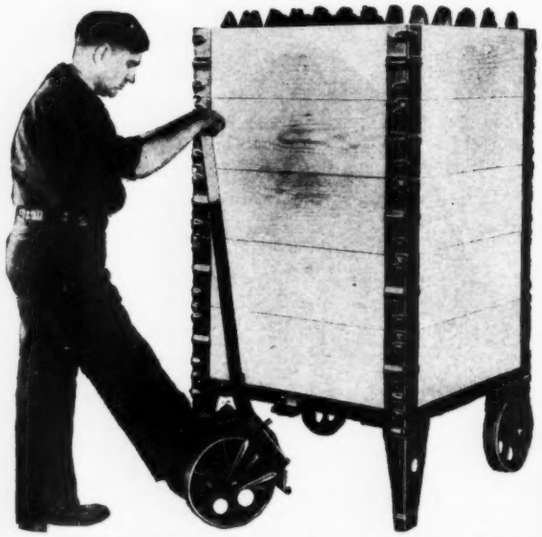
Your Best Formula for Reducing Costs

The soundest answer to industry's present great problem is increased efficiency all down the line. There IS a way to solve the HIGH-WAGE, LOW-PRICE challenge—and you've got to find that way to stay in business. You need the complete, co-ordinated TURNER SYSTEM OF MATERIALS HANDLING which has cut labor, space and equipment costs up to 50% for many American manufacturers.

60 DAYS FREE TRIAL
to Prove it in Your Own Plant

So that you may see for yourself how the TURNER SYSTEM works in your own plant, we are willing to ship an assortment of standard units on 60 DAYS FREE TRIAL. Send for them at once. Keep them for two months. Return them if they don't do the job. The trial costs you nothing except transportation charges. Write today asking us to sent this assortment to you. Complete information will follow immediately.

Shelf Racks fit on movable Transports. They may be lined up or moved as required.



Wooden Side or All-Steel Bin Sections, Racks, Trays and Die Tables fit on the Turner Transport which is moved by hand "Jimmy," power lift truck, crane or tractor. "DELIVER THE BIN AND SAVE THE HANDLING" is typical of TURNER SYSTEM SAVINGS.

Everything on Wheels and Ready to Go!

With the TURNER SYSTEM you have every Box, Bin, Shelf and Rack STANDARDIZED, INTERCHANGEABLE, MOVABLE—efficiency that saves its cost many times. Continuous plant rearrangement is as simple as moving units already on wheels.

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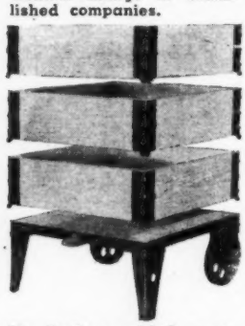
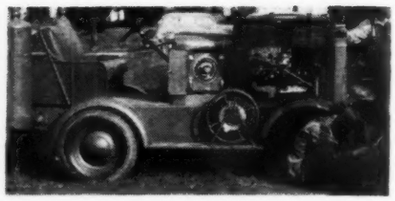
Write on your letterhead for the complete outline of the TURNER SYSTEM—sent without charge to established companies.



Bin Sections added or removed as required.

SEND FOR YOUR FREE TRIAL ASSORTMENT TODAY!

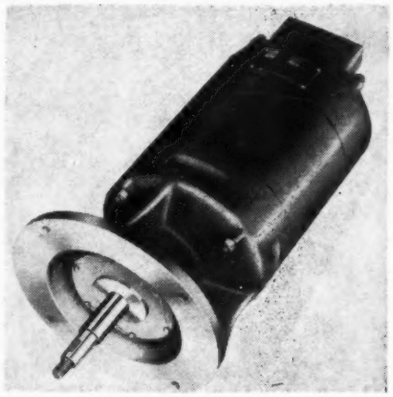
FACTORY SERVICE COMPANY
4605 NORTH TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN



permits immediate welding at any desired cable length. The unit has an automotive type transmission The Hobart Bros. Co., Troy, Ohio.

MOTOR

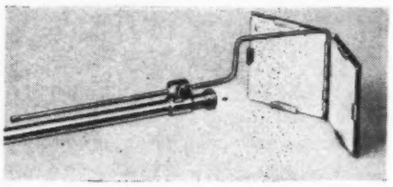
Fan-cooled, open-type, two-pole 3600-r.p.m. motor has output speed stepped up to 8000 r.p.m. by single-reduction helical gears in a sealed gear box. Manufacturer says



it will deliver 5 horsepower from 3-phase, 60-cycle, 220-volt power source. Electrical Eng. & Mfg. Corp., 4606 West Jefferson Blvd., Los Angeles 6.

INSPECTION MIRROR

The Stay-Fast duplex mirror can be used for inspection in almost every industry. With it the side, back, and top of the subject can be viewed at one time. Size of each duplex mirror is 1½x1½ inches. They



are joined together by a sturdy hinge. Can be opened or closed to any desired position, because there is sufficient tension to the hinge to hold mirrors in place. Van Wagner Co., 89-04 113 St., Richmond Hill 18, N. Y.

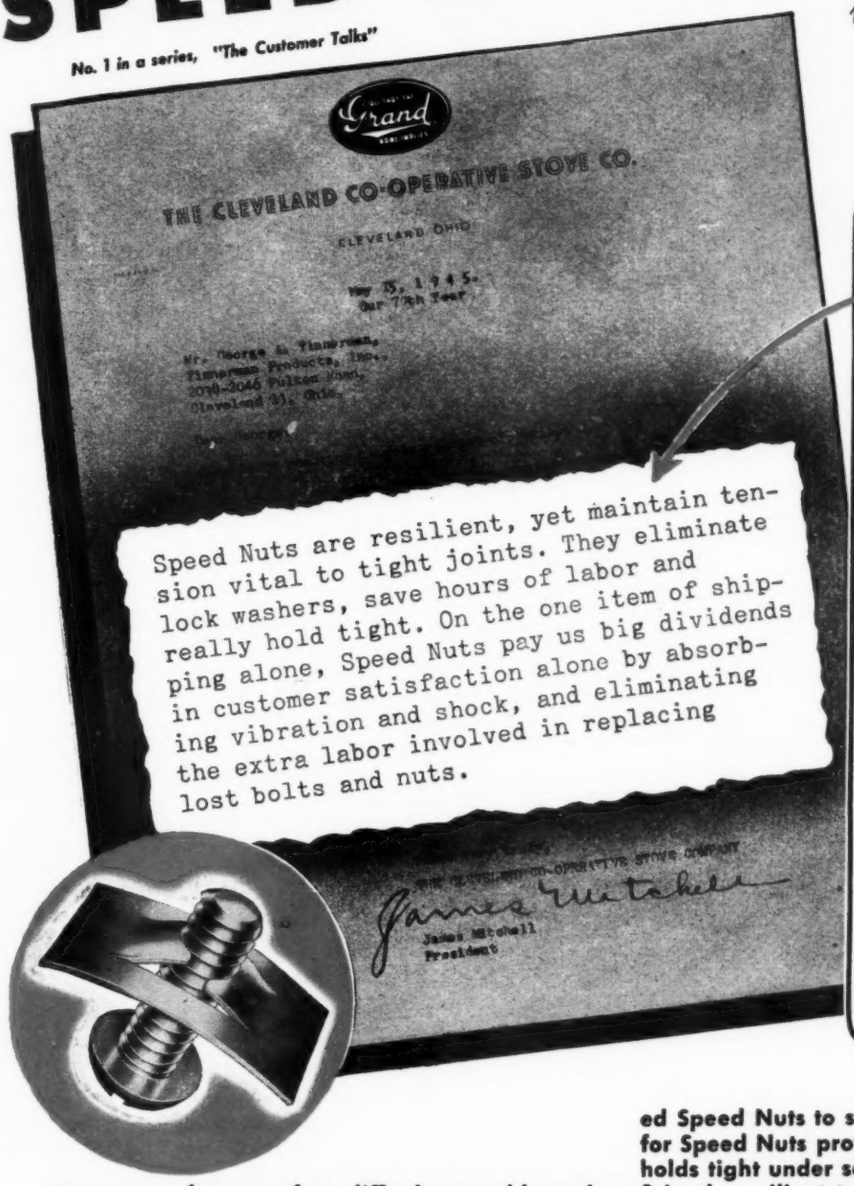
CONVECTOR-RADIATOR

Radiator, said to combine the advantages of convected and radiant heating, can be installed either as an exposed floor cabinet or as a semi-recessed unit. Universal header permits either top or bottom connections at each end. It is suitable for gravity or forced hot water system, or two-pipe steam system. End connections to either top or bottom tappings can be made through knockouts provided in the ends

Let SPEED NUT USERS *tell you why*

No. 1 in a series, "The Customer Talks"

They Changed to Speed Nuts


Grand
THE CLEVELAND CO-OPERATIVE STOVE CO.
CLEVELAND OHIO
Speed Nuts are resilient, yet maintain tension vital to tight joints. They eliminate lock washers, save hours of labor and really hold tight. On the one item of shipping alone, Speed Nuts pay us big dividends in customer satisfaction alone by absorbing vibration and shock, and eliminating the extra labor involved in replacing lost bolts and nuts.
James Mitchell
President

ASSEMBLY ADVANTAGES

- Prevent vibration loosening
- Protect fragile materials against damage
- Eliminate lock washers
- Eliminate handling of material
- Applied faster
- Perform multiple functions
- Will not "clog" or "freeze"
- Reduce assembly costs
- Weigh less

Stove manufacturers face difficult assembly problems. The severe vibration and shock that stoves are subject to during transportation to the ultimate consumer must be met. Allowance must also be made for expansion and contraction of porcelain enamel parts when the stove is heated up to 500 degrees.

The Cleveland Cooperative Stove Company selected Speed Nuts to solve their fastening problems, for Speed Nuts provide a spring tension lock that holds tight under severe vibration and yet is sufficiently resilient to prevent damage to porcelain enamel surfaces. In addition, Speed Nuts eliminate lock washers, reduce assembly time and weigh less.

Speed Nuts will pay you big dividends, too. In writing for samples, please give complete assembly details, as Speed Nuts are made in more than 3000 shapes and sizes.

TINNERMAN PRODUCTS, INC. • 2096 FULTON ROAD, CLEVELAND 13, OHIO

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London
In France: Aerocessoires Simmonds, S. A., Paris
In Australia: Simmonds Aerocessories, Pty. Ltd., Melbourne

Speed Nuts* PATENTED

* Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS

WHEN YOU *PLAN* YOUR NEXT INDUSTRIAL HAULING EQUIPMENT...

Remember...

GENERAL INDUSTRIAL PNEUMATICS
cut material handling costs five ways—

1 ***Generals move material faster***...efficiency saves labor, *speeds production.*

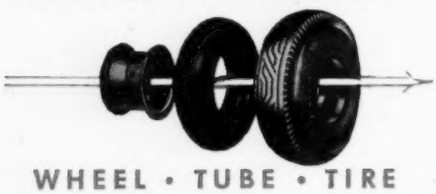
2 ***Generals move loads easier,*** over rough, smooth or soft surfaces...*stop spillage, breakage.*

3 ***Generals cushion load and truck***..avoid equipment breakdowns due to *jarring and jolting.*

4 ***Generals end excessive floor wear*** . . . do not cut asphalt, linoleum — *cannot cut or chip.*

5 ***Generals reduce maintenance***...handtrucks and cargo wagons *stay in service.*

FACTORY ASSEMBLED

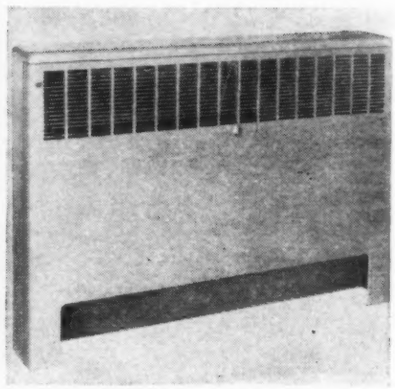


WHEEL • TUBE • TIRE

The GENERAL TIRE

Dept. 10
THE GENERAL TIRE & RUBBER CO.
AKRON, OHIO

INDUSTRIAL PNEUMATIC TIRE • TUBE • WHEEL UNITS



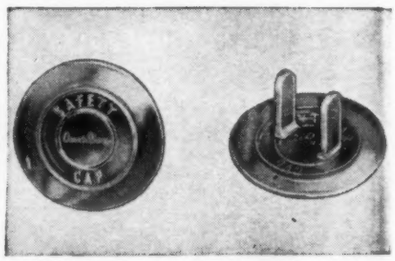
of the cabinet. The line contains 57 sizes in 3 standard depths and lengths, with capacities ranging from 16 to 100 square feet. The Trane Co., La Crosse, Wis.

PRE-PAINTING PREPARATION

Clear liquid known as Hold-Tite is used to prepare glossy surfaces for coating, and to remove wax and grease. Treated surfaces are said to have a slight tackiness which produces an effect similar to that of sandpapering. When added to new paint in the ratio of 1 to 8, preparation is claimed to cause the paint to bind or anchor more permanently to old finishes. Gillespie Varnish Co., Dey and Howell Sts., Jersey City 6.

OUTLET CAP

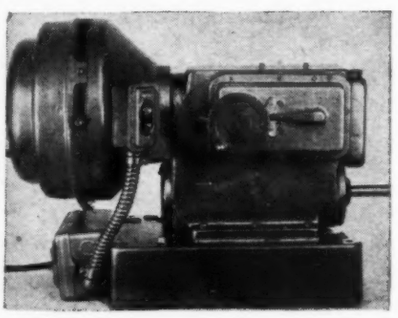
Safeguarding against possible shock when cleaning in or around electrical outlets on walls, floors, baseboards, and workbenches,



as well as protection of the current from interruption by foreign matter in the outlets, is provided by transparent plastic safety cap. Amerline-Chicago, 1753 N. Honore St., Chicago 22.

VARIABLE SPEED DRIVE

Model HT2 hydraulic variable speed transmission is equipped with an axial air-gap type, built-in, electric drive motor, and



Personalized Lighting . . . Instantly! DAZOR ALONE *Floats!*

CONCENTRATED light exactly *where* and *when* you want it! Light of the right *quality* and *quantity,* positioned so you can see the details of fine work quickly, with comfort and ease! Such are the advantages of Dazor, the *floating* lamp.

With your finger tips you simply float Dazor into the position desired. Lift your hand and the light *stays put* . . . automatically. A patented balancing mechanism makes further adjustment unnecessary. Dazor alone *floats.*

Provide personalized Dazor lighting for every task in your plant or office which requires precise, accurate seeing. Increase the efficiency and productivity of your workers, reduce accidents and waste.

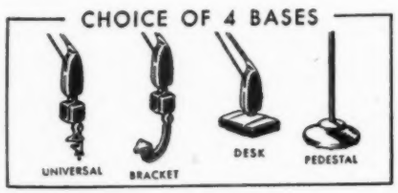
Phone YOUR DAZOR DISTRIBUTOR . . . let him demonstrate Dazor seeing benefits. For your distributor's name, if unknown to you, write to Dazor Manufacturing Corp., 4481-87 Duncan Ave., St. Louis 10, Mo. *In Canada* address inquiries to Amalgamated Electric Corporation Limited, Toronto 6, Ont.

No squinting or nervous muscular tension here—the work area is brilliantly Dazor-lighted.

With "personally-fitted" Dazor lighting, this diamond setter adds the finishing touches to a ring mounting.

Instantly adaptable to the seeing conditions required, Dazor lighting permits speedier treatment of first aid cases.

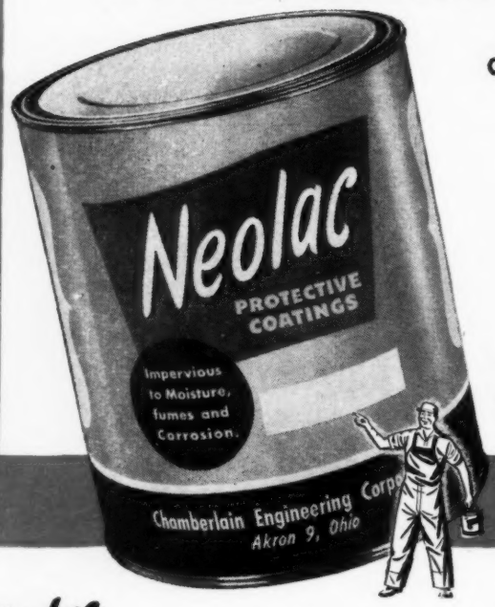
CHOICE OF 4 BASES



DAZOR *Floating* LAMPS

FLUORESCENT *and* INCANDESCENT

New PLASTIC COATING STOPS CORROSION ...Cuts Maintenance Costs



NOT A PAINT BUT A CHEMICALLY RESISTANT LIQUID PLASTIC

•

AS EASY TO USE AS ANY PAINT

•

WILL NOT CHECK, CRAZE OR CRACK

•

FOR METAL, WOOD, CONCRETE AND BRICK

Neolac is a new type of maintenance coating . . . . made from a combination of chemically inert, thermoplastic and thermosetting resins . . . liquefied by the use of special high-boiling-point solvents. Neolac is applied like any paint, by spray gun or brush. When the solvents evaporate (Neolac dries within a few minutes) a tough, sturdy, corrosion-resistant plastic film is formed. This tight, non-oxidizing plastic "skin" resists acids, alkalies, alcohols, water, fumes and weather — provides longer "sure-fire" protection for your plant and equipment.

★ LOW ORIGINAL COST

★ GALLON COVERS 450 SQ. FEET

★ NO PRIMER NEEDED . . . 2 COATS AMPLE

★ LEAVES NO SKIN IN CAN . . . NO WASTE

★ EXTREMELY LOW PERMEABILITY

★ RESISTS HEAT UP TO 265° F

SPECIAL Introductory Offer for Comparative Test Purposes

One quart of either Neolac Black, Gray, Green, Clear or Aluminum, plus one pint of Neolac Thinner, $2.80 prepaid anywhere in the U.S.A.

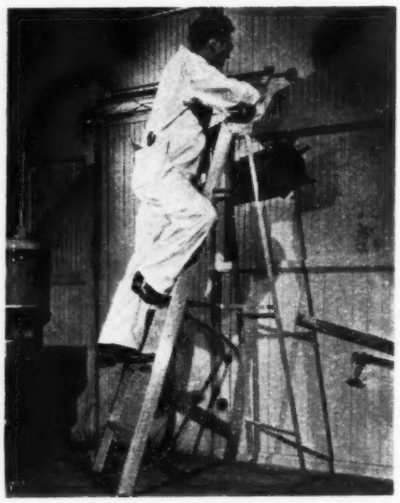
CHAMBERLAIN ENGINEERING CORPORATION

5000 BRIMFIELD RD., AKRON 9, OHIO

is available in 2-, 3-, and 5-hp. size ratings. Infinitely variable speeds throughout the range from zero to neutral, to full drive motor speed (both forward and reverse) are said to be instantly available. In addition, the unit provides starting torque at all times for heavy load starting. Portman Machine Tool Co., 70 Portman Road, New Rochelle, N. Y.

STEPLADDER

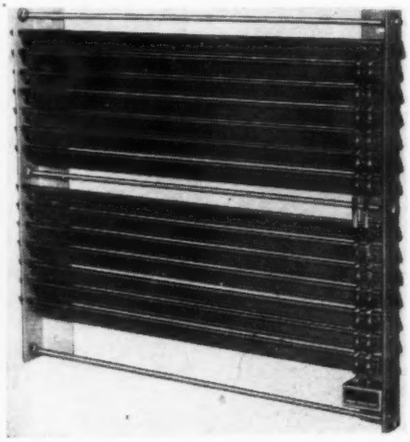
Amplex aluminum ladders, weighing less than 2 pounds per foot of height, eliminate splinters and warping. Steps are built for 500-lb. working load, and ladder has been

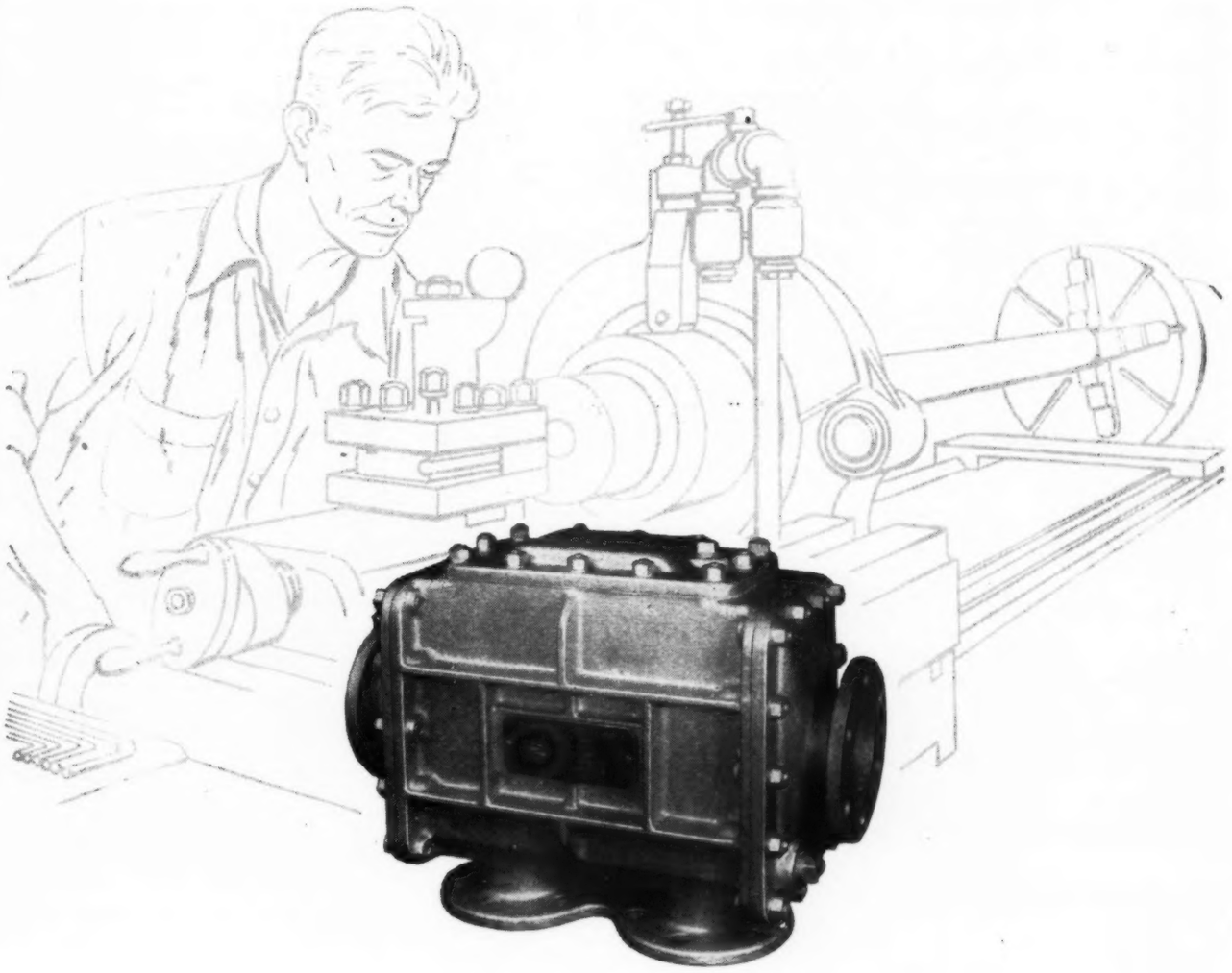


tested up to 1200 pounds, maker says. Has rubber matting on top step and work shelf, and feet are equipped with rubber guards. Steps are made of extruded aluminum, with tread to prevent slipping. Jarvis Mfg. Co., Glendale, Calif.

OVEN HEATER

Chromalox oven heater, Type NOU Modified, operates at oven temperatures up to 950 degrees. Design provides a high heating capacity in a small space. Heating element terminals are centralized at one end of the assembly, and all electrical connections are brought to a single enclosed terminal box to simplify wiring. Assembly consists of 14 high-temperature chrome steel sheathed strip heaters, giving a combined rating of 8 kw. at 230 volts. End brackets of heavy sheet metal





Harrison Oil Coolers Reduce Maintenance Costs

With lube oil temperatures kept within proper operating range by Harrison Oil Coolers, machines operate for longer periods without excessive wear, requiring less frequent and less costly maintenance. Maximum effectiveness is obtained from the lubrication of bearings and other critical parts.

In industrial applications of all types, Harrison Oil Coolers are an important factor in increasing and maintaining production efficiency and economy. Your inquiry concerning specific applications in your plant will receive the immediate attention of our engineers.

HARRISON

HARRISON RADIATOR DIVISION OF GENERAL MOTORS, LOCKPORT, NEW YORK

KRANE KAR cuts handling time! *It lifts, transports, and spots the load.* No need to face the work . . . swing the "live" boom from side to side and up or down, by power, with full load on the hook. **KRANE KAR** has unsurpassed speed, stability and maneuverability for indoors or outdoors operation . . . simplifies handling, cuts your costs. Let the **KRANE KAR** representative tell you how.

Write for Our New Catalog No. 58

USERS: Basic Magnesium, Carnegie-Illinois, General Motors, Pullman-Standard Car, Lima Locomotive, Bethlehem, Allegheny Ludlum Steel, etc.

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

2½, 5, AND 10 TON CAPACITIES

KRANE KAR

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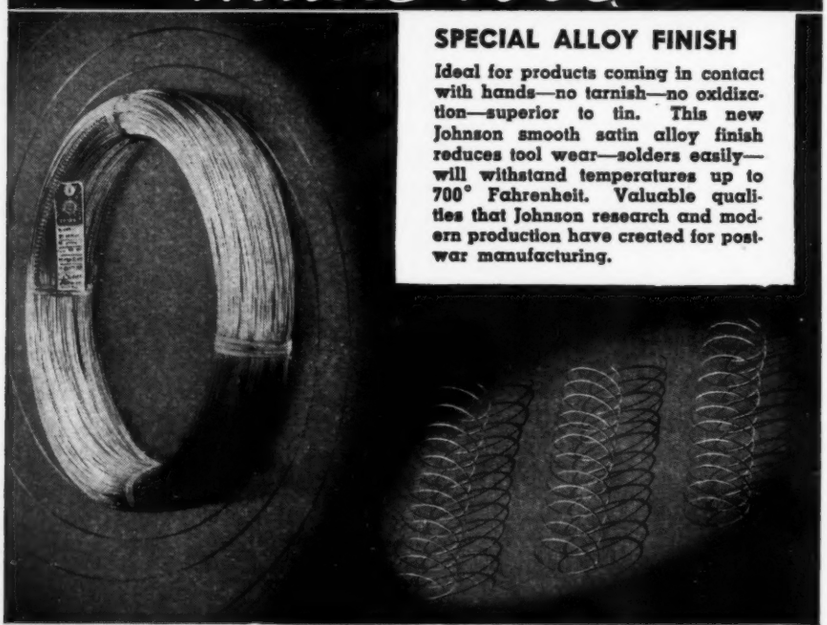
SILENT HOIST & CRANE CO., 855 63rd ST., B'KLYN 20, N.Y.

JOHNSON XLO *Music Wire*



SPECIAL ALLOY FINISH

Ideal for products coming in contact with hands—no tarnish—no oxidization—superior to tin. This new Johnson smooth satin alloy finish reduces tool wear—solders easily—will withstand temperatures up to 700° Fahrenheit. Valuable qualities that Johnson research and modern production have created for post-war manufacturing.

JOHNSON STEEL & WIRE CO., INC.

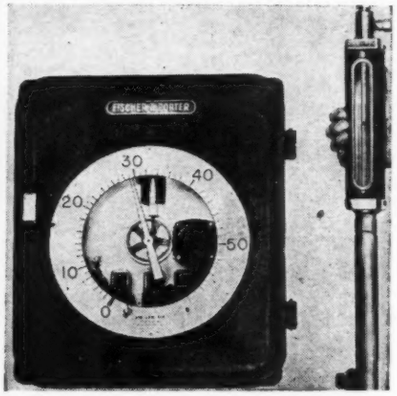
WORCESTER 1, MASSACHUSETTS.

NEW YORK AKRON DETROIT CHICAGO LOS ANGELES TORONTO

are punched for mounting to walls or bottom of oven. Edwin L. Wiegand Co., 7518 Thomas Blvd., Pittsburgh, 8.

FLOW METER

Flow rates of less than 5 milliliters of liquid per minute, and for gases, of less than 25 milliliters per minute, can be measured as well as remotely and automatically



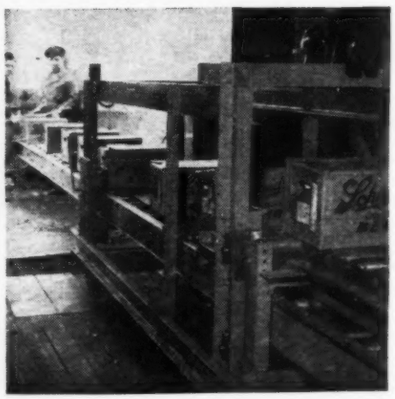
recorded, controlled, and totalized by means of instrument known as Roto-Tronic. When attached to maker's Rotameter, it electronically detects float position, amplifies electric current for control of recorder pen, and operates large remote indicators, recorders, controllers, and totalizers. Fischer & Porter Co., Dept. 4Q-4, Hatboro, Pa.

CHANGE IN NAME

The name of Coaltoter Conveyor Company, 310 South Michigan Ave., Chicago, has been changed to Material Movement Industries, in keeping with its extended activities in the materials handling field. Material Movement Industries manufactures electric and gasoline engine-driven portable conveyors, under the trade names of Tote-All and Coaltoter Portable Conveyors, for bulk and packaged materials.

TRUCK LOADER

Cantilevered belt conveyor, known as Projectoveyor, can be projected into a trailer truck by one man to any distance up to 19 feet. The power driven conveyor, which can operate in either direction is placed within reach of the man in the trailer, reducing time for loading and unloading. The transfer point inside the building is



new scope for America's drawing boards

Now manufacturers can fully use the sparkling eye appeal and sales value of decorative wood veneers . . . and fabricate them as easily as sheet metal.

Haskelite Ornametl consists of a thin wood veneer permanently bonded to sheet steel or aluminum of almost any gauge. Ornametl may be stamped, pressed or rolled to shape. It can be sawed, drilled, punched and welded.

Pictured above is a station wagon side panel. It illustrates Ornametl's beauty and workability. Here is a material to challenge the imagination of the creative designer. He will recognize its possibilities for interiors, appliances, and a host of other applications. Write for details today.

The many advantages and uses of Ornametl, Plymetl, and other Haskelite products, are fully described in the "Plan With Plymetl" and SC-45 bulletins. Let these bulletins be your guide to greater profits. Write for your free copy today.

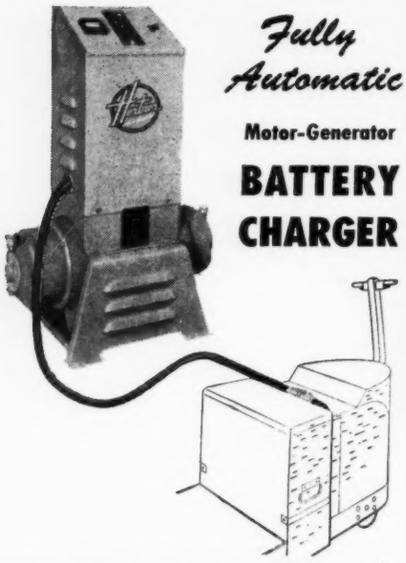
HASKELITE MANUFACTURING COMPANY Dept. MM-3 Grand Rapids 2, Michigan

NEW YORK CHICAGO DETROIT CLEVELAND ST. LOUIS PHILADELPHIA

CANADA: Railway & Power Engineering Corp., Ltd.

For **PEAK PERFORMANCE** *from your Motorized* **LIFT-TRUCKS** *Every Day*

use the HERTNER Type "H"



Fully Automatic

Motor-Generator

BATTERY CHARGER

FULLY CHARGES LEAD-ACID BATTERIES in 8 hours

NICKEL-ALKALINE BATTERIES in 7 hours

Automatic Charging Rate

Amount of charge is governed by completely automatic controls—over-charging is impossible, yet a fully rundown battery can be completely charged in normal charging time.

Automatic Shut-off

Completely automatic controls cut off the charge and shut down the motor-generator when the battery reaches full charge.

Automatic Restart

In the event of power failure, generator shuts off automatically and when power is restored motor-generator automatically restarts and charging is resumed.

"Automatic" Economy

Due to the inherent characteristics of motor-generator design, the Hertner Type "H" charger provides "automatic" economy.

Write for Bulletin 101 describing Type "H" single-battery charger. Hertner Type "H" chargers are also available for charging 2 or more batteries at one time. Write for Bulletin 102.

The* HERTNER *Electric Co.

A General Precision Equipment Corporation Subsidiary

Motors • Generators • Motor-Generator Sets

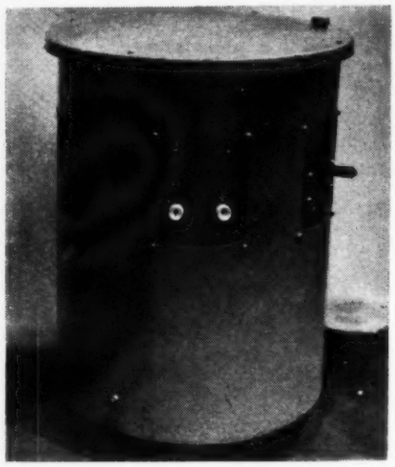
12750 Elmwood Avenue, Cleveland 11, Ohio

Representatives in principal cities throughout the world

fixed, and no portable sections or supports are required. Made of aluminum, unit is held to minimum weight, and will handle a load of 20 pounds per foot when fully extended, maker says. Conveys commodities up to 19 inches wide. Standard Conveyor Co., Dept. A, North St. Paul 9, Minn.

MOBILE BRAZER

Designed for general brazing service, a 20-kva. portable brazer with water-cooled tongs is announced. Enclosed in a circu-



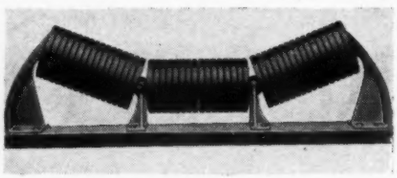
lar steel housing, the unit is self-contained, having a contactor for energizing or de-energizing the brazing circuit, an adjustable heat brazing transformer, and a water-cooling system for the tong cooling water. The unit requires only connection to a 220- or 440-volt power source. Control panel, built into the front of brazer, contains a control switch, outlets for brazing cables, receptacle for foot switch pilot cable, and voltage tap changing plug. Westinghouse Electric Corp., Pittsburgh 30.

RECIRCULATING VALVE

Automatic recirculating valve, operated from the fluid flow, is designed to bypass the minimum quantity of fluid required to eliminate pump overheating. As quantity increases, the bypass quantity is automatically throttled and reduced to zero, when the output of pump is sufficient to prevent pump failure. The valve may be installed in existing pump by removing any elbow in the discharge piping upstream of all checks and stops. Hammel-Dahl Co., 243 Richmond St., Providence 3.

CONVEYOR IDLER

Impact cushioning troughing idler for belt conveyors is known as Rex Style No. 35. Each roll of the idler consists of a rubber cylinder vulcanized directly to the assembly tube. Manufacturer recommends that three to four units be used directly under the loading point, spaced at one-half the normal idler spacing. Grooving



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"Those Flintkote Industrial Adhesives helped us solve that production problem"

. . . that's the sort of enthusiastic comment frequently heard from industrial engineers who specify and use Flintkote processing materials in their plants.

The diversified line of Flintkote industrial products now includes many basic and compounded materials with proven performance records. They fit individual needs . . . improve end results . . . save valuable man-hours.

Flintkote manufactures asphalt and rubber base specialties . . . aqueous dispersions . . . protective coatings . . . adhesives . . . sealers . . . saturants . . . insulators . . . and many others.

Frequently, these found their places after Flintkote Service Technicians had studied conditions on the job. Then, with the aid of Flintkote Research Laboratory, a better, quicker, or less expensive method was worked out. The services of these specialists *are now available to you.*

OTHER WELL-KNOWN FLINTKOTE PRODUCTS

HYDRALT* Protective Coatings, the many purpose asphalt emulsions, will outlast other bituminous materials exposed to weather . . . Flintkote Flooring Emulsions, the key to heavy-duty mastic flooring . . . FLINTDEK†, anti-slip floor coating, for safeguarding smooth floor areas . . . SYNTEX* Products . . . aqueous dispersions of rubbers and resins, for combining, impregnating and coating. Write for full information without delay.

*Trade-mark Reg. U. S. Pat. Off. †Trade-mark

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M·S·A COMBUSTIBLE GAS ALARM

EXPLOSION-PROOF TYPE EX-SM WITH EXPLOSION-PROOF MULTI-POINT SAMPLING VALVE for use with REMOTE RECORDING POTENTIOMETER

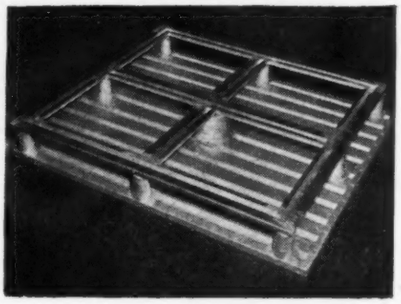
Continuously measuring combustible gas and vapor hazards in air at a number of selected points within the plant, this compact panel installation employs the M.S.A. Explosion-proof Combustible Gas Alarm with explosion-proof Multi-point Sampling Valve. Air may be sampled at 4, 6 or 8 different localities, with the sampling point under test at any period automatically shown by visible number on annunciator lights. The amount of combustibles present in the sampled atmospheres is shown on a remote continuous graphic recorder; the Alarm actuates a warning signal when gas concentrations at any point exceed the predetermined limit. Write for descriptive details!

MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS & MEADE STREETS PITTSBURGH 8, PA.
District Representatives in Principal Cities
In Canada: MINE SAFETY APPLIANCES COMPANY OF CANADA, LIMITED
TORONTO, MONTREAL, VANCOUVER, CALGARY, NEW GLASGOW, N. S.

is claimed to permit deflection under impact without impairment of roll stability. Rollers are equipped for high-pressure grease lubrication. Chain Belt Co., 1600 West Bruce St., Milwaukee 4.

ALUMINUM PALLETS

Rust-proof, non-sparking, and non-combustible 40x48-in. all-aluminum pallet weighs only 36 pounds. Top of pallet is formed from two sheets of aluminum, ribbed in opposite directions and spot-welded together. Manufacturer claims ribbing reduces load slippage and prevents warping or distortion under loads up to 13



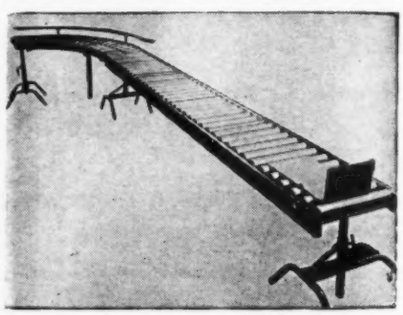
tons. Welded one-piece lower deck is riveted to upper deck through tubular load-carrying members which are placed to permit forked lift truck to approach the pallet from any side or corner, thereby increasing flexibility of stowing by requiring truck to make only 45-deg. turn in aisle to tier or pick up pallet. Said to reduce accident hazard by elimination of splinters and sharp edges, and to be especially useful in the food industries because it will not absorb odors, hence can be used without discrimination as to previous or subsequent loads. Other sizes available are 32x40, 42x50, and 48x48 inches. Reynolds Metals Co., 2500 South Third St., Louisville 1.

PLASTIC SURFACE CLEANER

Known as Glit, cleaner for plastic and glass surfaces, is said to have low surface tension and high detergent qualities without the tendency to dissolve the surface of sheet or molded plastic. Cuts through grease, film, and bug stains. Comes in a concentrated form to which three to seven parts of clean water are added. Available in quart and gallon containers. Kano Laboratories, 75 East Wacker Drive, Chicago 1.

GRAVITY CONVEYOR

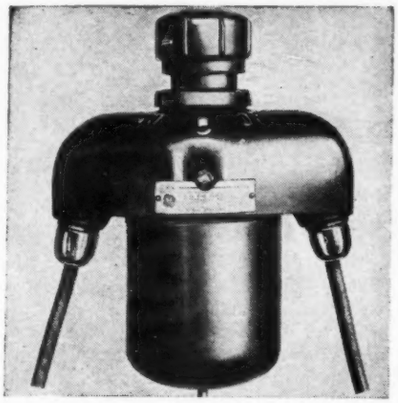
Irregular-surfaced materials, such as cans with chimes, kegs, light drums, cartons, crates, boxes, steel bars, or long and nar-



row pieces of light lumber, can be moved by roller gravity conveyor. The two standard frame lengths are 5 and 10 feet, in widths of 12 or 18 inches. Each roller axle serves as an auxiliary cross-brace, and gives additional rigidity to the 12-gage steel conveyor frame. Rollers, 2 inches in diameter, are spaced at 3-, 6-, 9-, or 12-in. intervals. Maximum recommended capacity is 80 to 100 pounds per foot of distributed load. Rapids-Standard Co., Inc., 342 Peoples National Bank Bldg., Grand Rapids 2, Mich.

OIL-FUSE CUTOUTS

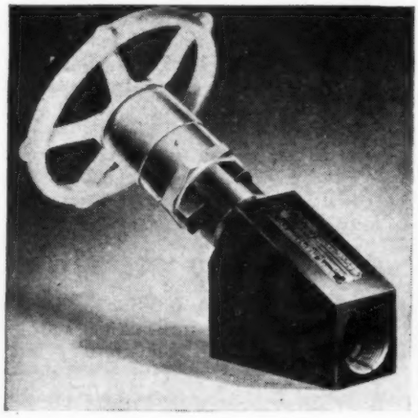
Line of heavy-duty oil-fuse cutouts, for overcurrent protection of power distribution systems in the 2400-, 4160-, 4800-, and



7200-volt classes, is announced. Utilizing universal fuse links, models are available for clearing fault currents up to 11,000 amperes. Cutouts have no exposed live parts, and no arc flames are ejected during current interruption providing increased safety. General Electric Co., Schenectady.

VALVES

Series "V" and "VL" valves have 30-deg. body design in the globe pattern, which is said to effect a minimum change in the direction of flow through the valve. Manufacturer claims that turbulence is almost entirely eliminated by having the flow stream carried through the valve in the direction of closing. Solid one-piece stem and plug is employed to effect tight shutoff when closed. All threaded surfaces and operating parts are protected by an encasing cap shield. Operating parts are lubricated by a sealed-in lubricant which is zoned away from the



ALLEN

SOCKET HEAD CAP SCREWS

In tooling jigs and fixtures these are the universal screws, either for powerful clamp set-ups or fine, precise adjustments. Their strength of head and accuracy of thread are achieved by Allen *pressure processes* that eliminate weaknesses caused by cutting the stock.

The above view was taken in the toolroom of Douglas Aircraft Company, Santa Monica, Calif. In small tooling jigs like the one above and equally in the heaviest welding fixtures, "Allens" have the *clamping-power* to depend on! Threads are accurate to a high Class 3 fit, for a maximum of frictional holding-power in the tapped hole. Internally engaging hexagon keys are obviously the handiest of wrenches for this work.

TRADE A MARK

Allen Hex-socket Screws and "Tru-Ground" Dowel Pins supplied only through Industrial Distributors in all centers.

THE ALLEN MANUFACTURING COMPANY
HARTFORD 1, . . CONNECTICUT, U. S. A.

HEIN-WERNER
HYDRAULIC JACKS
have POWER to spare!

Factory tested at 1½ times their rated capacity, H-W Jacks have power to spare on a thousand and one time and labor-saving jobs in your plant.

In the illustration above a 30-ton H-W Jack is attached to a 36″ filter press. The job of closing the press can be done in less than 30 seconds by one man, whereas two men required 3 to 5 minutes with the old gear and pinion method.

For maintenance work, conversion jobs, or production line operations . . . for bending rods, and a wide variety of other jobs, H-W Jacks can go to work for you on a time and labor-saving basis.

Made in models of 3, 5, 8, 12, 20, 30 and 50 tons capacity. Consult your nearest industrial supply distributor or write us.

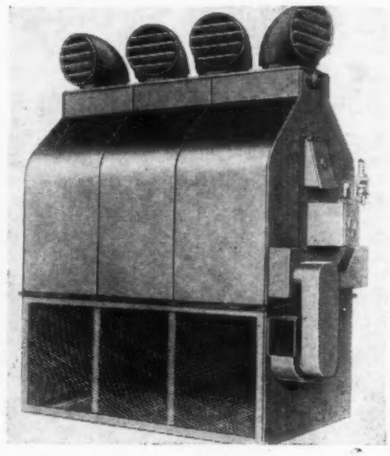
30 TON MODEL

HEIN-WERNER MOTOR PARTS CORP.
WAUKESHA, WISCONSIN

flow stream. Series includes quick opening shutoff valves, throttling valves, internal and external check valves, and strainers. Grove Regulator Co., 65th & Hollis Sts., Oakland, Calif.

DIRECT-FIRED HEATERS

Capacities of 75,000 to 2,000,000 B.t.u. output per hour are available with heaters designed for gas and oil firing. Units are



made of steel, are self-contained, and are equipped with fully automatic control systems. Applications include air distribution direct through rotatable diffusers or through ducts. Filters may be applied without special transformations, and tubes may be cleaned on floor. H. H. Davis Co., Cicero, Ill.

DIAL TYPE THERMOMETER

Temperatures from 100 to 950 deg. F. are indicated by all-metal, dial-type thermometer. It is provided with a slip-on handle which protects the operator's hand when the instrument is in portable use. Features claimed for instrument include quick response to temperature change; all-metal construction for maximum protection against vibration, shock, and rough handling; precision bimetallic temperature element that has no pivots, mechanical linkages, or gears, and provides sustained accuracy within 1 percent of scale range. Thermometer is designed to withstand momentary over-scale temperatures within 10 percent of scale range. Bacharach Industrial Instrument Co. 7000 Bennett St., Pittsburgh 8.

FLUORESCENT LAMPS

Fluorescent lamps, designated as 4500-deg. white lamps, in 40-watt T12 and 100-watt T17 sizes, are for applications where a light source warmer-colored than the standard 6500-deg. daylight lamps and cooler than the 3500-deg. white types is desired. Initial ratings for the lamps are 50 lumens per watt for the 40-watt size and 40 lumens per watt for the 100-watt size. Sylvania Electric Products Inc., Salem, Mass.

CABLE-LOOPING VISE

Vise has been developed to form a loop in wire rope by turning one hex nut with an ordinary wrench. It automatically compensates for rope sizes in its designed range, and holds the loop firmly through

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

U. S. Rubber promises that its solid neoprene tires will reduce the power consumption of materials handling equipment as much as 60%.

get ready with CONE for tomorrow

Shell Development Company has patent rights to a new internally cooled piston in which the upper end of the connecting rod forms the top of the piston.

get ready with CONE for tomorrow

Glenn L. Martin Co. will make commercially available their war-developed process for printing photographs on almost any surface.

get ready with CONE for tomorrow

B. L. McClure Inc. of Norwalk, Ohio, has been licensed to manufacture a limited number of Hickey engines. This 2-cycle engine has variable compression adapting it to various fuels and loads.

get ready with CONE for tomorrow

Du Pont has announced a new plastic, called "Teflon", which resists acids including boiling sulphuric and aqua regia.

get ready with CONE for tomorrow

Promenette Radio & Television Corp. of Buffalo will make the electrical circuits on its radio sets by spraying metal lines on a plastic base.

get ready with CONE for tomorrow

Cleveland Transit System reports that its electrically heated switches performed well through last winter.

get ready with CONE for tomorrow

Eastman Kodak has two new photographic papers that can be developed in one minute, fixed in two and washed in four.

Chance-Vought has developed a building panel made of balsa wood surfaced with aluminum sheets.

get ready with CONE for tomorrow

The International Ice Patrol will go into service again equipped with planes and radar.

get ready with CONE for tomorrow

A Westinghouse engineer prophesies the use of gas turbines in ships and central power stations.

get ready with CONE for tomorrow

Allis-Chalmers reports that the 3500 h.p. multistage gas turbine that it designed and built for the Navy has been operated at a gas temperature of 1350 F.

The Bunker Hill Naval Air Station at Peru, Indiana, has had three winters' experience with runways made with a cement dispersing agent. There seems to be no deterioration from freezing or deicing chemicals.

get ready with CONE for tomorrow

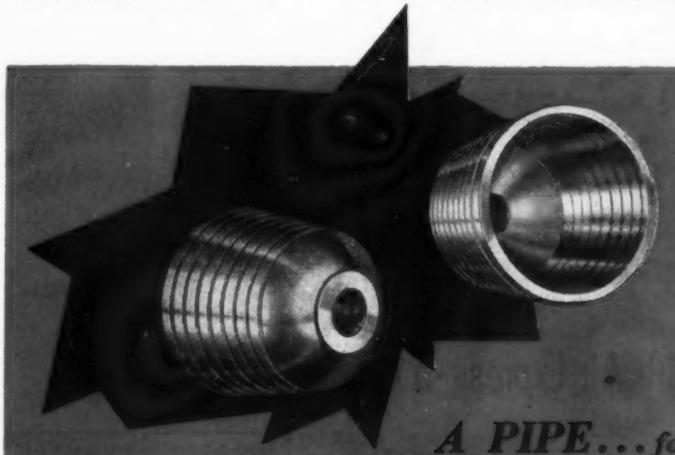
Ford Motor Co. has patents on an amphibious vehicle that looks like a small edition of the Army's famous "duck".

get ready with CONE for tomorrow

Buckminster Fuller's Dymaxion house is being readied for mass production by Beech Aircraft of Wichita. It is made largely of aluminum, weighs four tons, has 1017 sq. ft. of floor space and will sell for $6500.

get ready with CONE for tomorrow

Monsanto has a chemical treatment for cotton called "Syton" that is claimed to increase the strength of cotton yarn 40%.



A PIPE . . . for You

and for the 1⅝" 8-Spindle Conomatic

The walls of this aluminum pipe bowl are machined to eggshell thinness, uniformly, with quality finish and with 15-second regularity. The Conomatic is adaptable for machining a variety of parts and built to handle tough or free-machining stock in its stride.

Follow these pages to keep well informed on up-to-date automatic production.

Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

30

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AIR EXPRESS is like a warehouse on wings!

Whatever you need to keep your business rolling — you've *got it* in just a matter of hours when you get it by Air Express.

Yes, delivery speed by air is so fast, it's the next best thing to having your supplier's warehouse right next door.

Rates are drastically down from prewar days — a new economy that makes this service a greater money-maker than ever for thousands of firms throughout the nation.

Specify Air Express-a Good Business Buy

Shipments go everywhere at the speed of flight between principal U. S. towns and cities, with cost including special pick-up and delivery. Same-day delivery between many airport towns and cities. Fastest air-rail service to and from 23,000 off-airline communities in the United States. Service direct by air to and from scores of foreign countries in the world's best planes, giving the world's best service.

RATES CUT 22% SINCE 1943 (U. S. A.)					
AIR MILES	2 lbs.	5 lbs.	25 lbs.	40 lbs.	Over 40 lbs. Cents per lb.
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549	1.07	1.42	3.84	6.14	15.35¢
1049	1.17	1.98	7.68	12.28	30.70¢
2349	1.45	3.53	17.65	28.24	70.61¢
Over 2350	1.47	3.68	18.42	29.47	73.68¢
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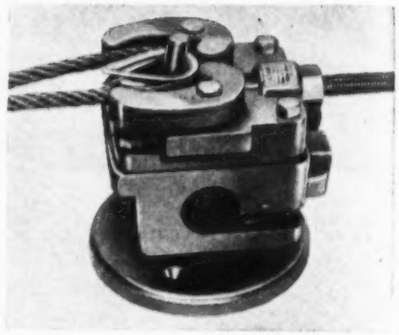
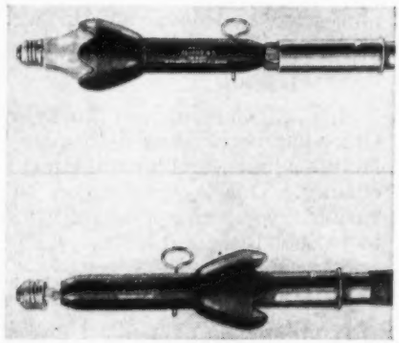


the splicing or clamping operations. Called Cabl-Vise, it is equipped with a swivel base that accommodates the tool in either a vertical or a horizontal position, and rotates through 360 degrees, clamping in any desired direction. Model No. 1 takes rope sizes ¼ through ½ inch, and No. 2, equipped with hydraulic booster, accommodates rope ⅝ through 1½ inch heavy-duty. Nunn Manufacturing Co., Evanston, Ill.

LAMP CHANGER

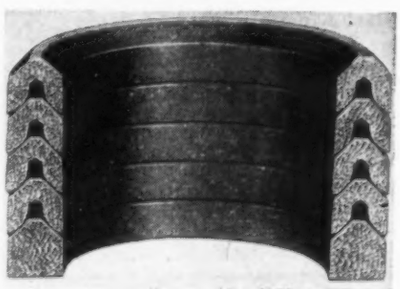
Safety lamp changer consists of three parts —changer head made of heavy-gage rubber, sectional poles of kiln-dried sugar pine or bass wood fitted with heavy metal couplings,



and an adapter which connects the changer head with the sectional pole. Operated by sliding rubber changer head over the bulb to be removed, and twisting. Fits bulbs from 25 to 1500 watts. Sectional poles come in lengths of 4 and 8 feet, and can be fitted together to reach any desired height. Changer head is reversible for removing broken bases with its tapered end. The G. R. Chadsey Mfg. Co., Inc., 595 New Park Ave., West Hartford 10, Conn.

PACKING RINGS

Palmetto Pyramid packing, in molded ring form, is designed for use in any stuffing box, and for rotary as well as reciprocal action. The manufacturer claims that the



ALWAYS *IN CHARGE* OF YOUR BATTERY ROOM

SILENTLY AUTOMATICALLY 24 HOURS A DAY

A typical installation of an FTR 8000-S-series Automatic Telephone Battery Charger.

Federal's
Telephone Battery Charger

Keeps batteries fully charged at all times—ready for any emergency

This compact charger—fully automatic and noiseless in operation—can be permanently connected to your battery installation. A voltage-sensitive relay holds the battery voltage within narrow limits by automatically varying the charging rate as needed—high charge or trickle, depending on battery potential. Both high and trickle charging rates are easily adjustable.

The d-c output circuit is filtered to prevent the introduction of "hum" on the telephone lines. Circuits are protected by fuses and an overload switch, and connections are provided for an alarm circuit to indicate overload or cessation of charging. Meters are also provided to indicate battery voltage, charging current and load current.

The Federal Selenium Rectifier used in these battery chargers is known throughout the electrical industry for its rugged construction and long trouble-free service. Federal telephone battery chargers are available for charging 12- or 24-cell batteries in ratings from 1 to 16 amperes d-c, with a-c input circuits for standard line voltages, 50 or 60 cycles, single phase. For complete data, write for Bulletin E 222.

DESIGN FEATURES

- Noiseless Operation
- Filtered Circuits
- Automatic Regulation
- Overload Protection
- Trickle and High Charge
- Alarm Contacts
- Federal Selenium Rectifier

Federal Telephone and Radio Corporation

In Canada:—Federal Electric Manufacturing Company, Ltd., Montreal
Export Distributor:—International Standard Electric Corporation

An IT&T Associate

Newark 1, New Jersey

Light RIGHT where it's Needed!

Supplementary lighting for close inspection of machines.

with APPLETON PORTABLE TYPE Reelite

REG. U. S. PAT. OFF.

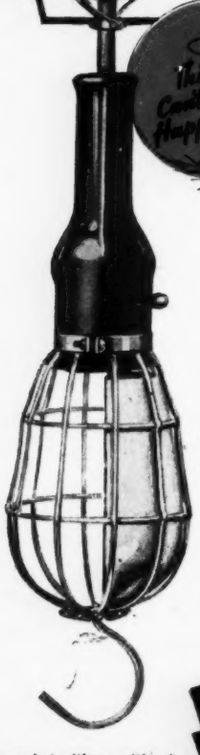
★ No tangles, kinks, or breaks in light cables!

★ Outlasts ordinary cord 6 to 1!

Any spot in your plant where portable light is a necessity—for machine inspection, car loading, stock-keeping, maintenance work and what not—Appleton Reelites furnish right light, instantly, safely, and with an almost unbelievable saving in wear and tear on lamp cord.

Reelites, which work on a rachet stop like a window shade, protect electrical cable—keep it reeled up out of the way, yet held at the desired length without tension. Accidents are eliminated, efficiency increased, cord costs cut to a minimum.

Practically every plant can use Reelites for lighting or for power tools. Reelites are available in machine tool and cloth-cutting types, and in heavy guard and vapor-proof types.



Levolier socket with or without switch in handle. Heavy wire guard takes 40 to 75 watt lamps.

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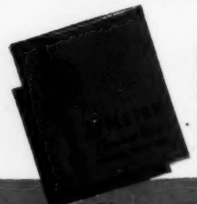
1715 Wellington Avenue • Chicago 13, Illinois
14 Branch Offices and 7 Resident Representatives in All Principal Markets



SEND TODAY
for this 50-page, illustrated Bulletin 504. Contains complete information on all types of Appleton Reelites—heavy-duty and portable, as well as special reels for air and fluid lines. Or see Sweet's File, page 2a/19.

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APPLETON
CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • RELITES

rings have no tendency to split under pressure. Sets are available in styles and grades to withstand any pressure, and temperatures up to 600 deg. F. Greene, Tweed & Co., Bronx Blvd. at 238th St., New York 66.

SWAY BRACE

Pre-engineered sway brace does not anchor piping rigidly, but permits movement of the piping out of the normal position when the moving force is large enough to overcome the restraining thrust of its single, pre-loaded, two-way-acting spring. Spring

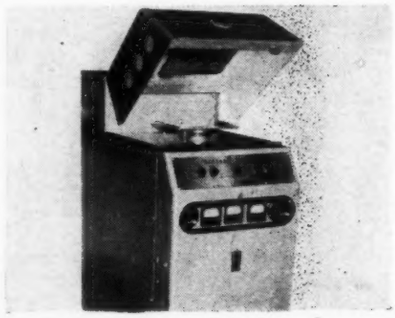
is pre-compressed between opposed thrust plates so that either a pull or a push on the rod is resisted by the spring. Grinnell Co., Inc., 260 West Exchange St., Providence 1.

PROTECTIVE COATING

For the protection of concrete, masonry, and metal structures from corrosion and deterioration, a cold-applied coating, called Bituplastic, has been developed. Contains no volatile solvents, eliminating discomfort to workmen and danger of fire or explosion when applications are made in confined space. Manufacturer claims the material is a fire retardant, is virtually odorless, and tasteless. Wailes Dove-Hermiston, Westfield, N. J.

DIELECTRIC HEATER

Electronic heater for dielectric heating of plastic preforms is designed for operation at 40 megacycles, using a water-cooled oscillator tube. Tube, operating at a high frequency and having ample short-time overload capacity, makes possible the use of an average full-power 5-kw. output during the entire heating cycle. Pre-heat cycle is started by means of a pushbutton station,



VEELOS ON REELS

...Cuts Machine Downtime
...Cuts Belt Costs

TAKE out your watch and note the time required to replace an endless V-belt in your plant . . . then check with Veelos. With Veelos, the link V-belt, you can uncouple any desired belt length . . . couple it endless . . . install it on any drive *in just a few minutes.* The comparison, we think you'll agree, shows that Veelos "packaged" on reels is a big time saver.

A single reel of Veelos eliminates costly investment in a multitude of sizes of spare V-belts . . . simplifies stock records . . . ends stockroom snarls caused by a confusing assortment of sizes. Each reel of Veelos holds 100 feet and requires only a negligible amount of space for storage.

Easy to take off the reel . . . easy to put on the drive, Veelos eliminates one cause of long, unprofitable work stoppages—helps keep production rolling. Speed up belt replacement . . . get real belt savings right off the reel with Veelos.

VEELOS
THE LINK
V-BELT
Adjustable to any Length
Adaptable to any Drive

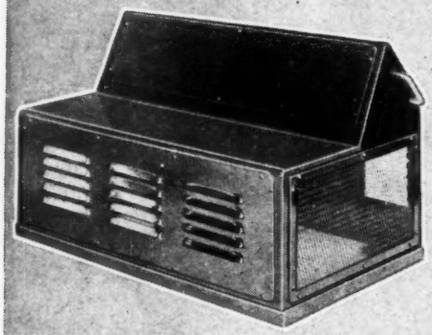
MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA

SHEET METAL FABRICATION

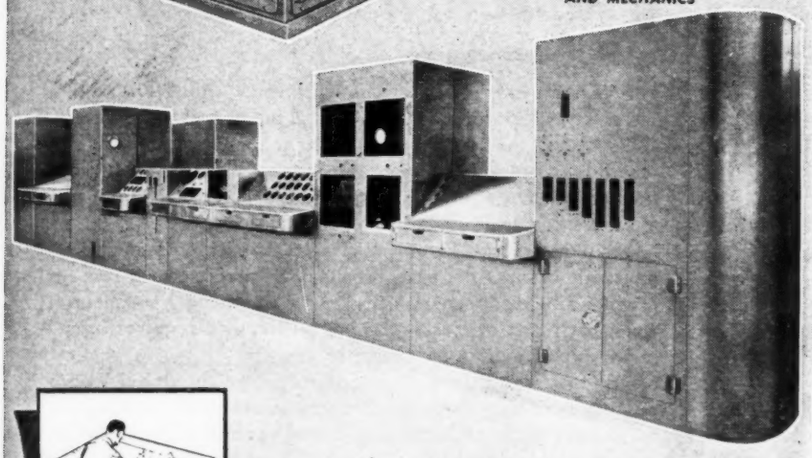
to Your EXACT *Specifications*

● Sheet metal parts and assemblies built to exact specifications is an everyday job here at Kirk and Blum. Thirty-nine years of specialized experience plus the most modern fabrication facilities enable us to produce products of Sheet Steel and Light Plate, Stainless, Aluminum, Monel and other alloys—in all gauges up to and including 3/8" thick.

Send us your blueprints for prompt quotation.



KIRK AND BLUM
AN ORGANIZATION OF ENGINEERS AND MECHANICS



The KIRK & BLUM Mfg. Co.
2835 Spring Grove Ave., Cincinnati 25, Ohio

and the rest of the operation is entirely automatic. Small enough to fit between two molding presses, the heater is able to accommodate the alternate operation of the two presses. General Electric Co., Schenectady, N. Y.

LIQUID CLEANING COMPOUND

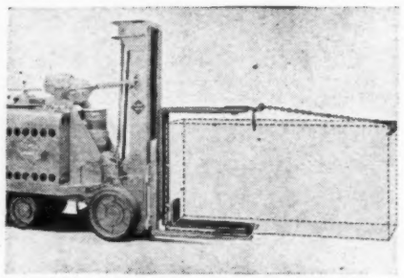
Detergent for use in steam cleaning is a water-soluble liquid compounded to keep the equipment in constant use, and to save wear and tear on parts. Manufacturer says it removes stubborn grease, oil, and grime accumulations from the surfaces and materials on which steam cleaning is employed, but does not affect paint or other finishes. The Penetone Co., Tenafly, N. J.

CHECK VALVE

The Numatic Safety Check is engineered to eliminate the danger of wildly whipping compressed-air hoses by shutting off air immediately in the event of excessive flow of air caused by accidental disconnecting or rupture in air line. The possibility of damage to compressors or manifolds through travel-back of whipping action in hoses also is obviated. Valve has two main parts—the housing and a steel ball, which seals off the port, shutting off air to the line when air flow is excessive. A bleed hole beside the discharge port allows the escape of a small amount of air to equalize pressure between air line and pressure tank when line is again made airtight. When pressure is nearly equal, the ball rolls away from port. E. D. Bullard Co., 275 Eighth St., San Francisco.

FORK TRUCK ATTACHMENT

Attachment for fork trucks includes a small turntable bolted to the truck's lower forks to support the load and permit it to be swiveled for maneuvering through box-

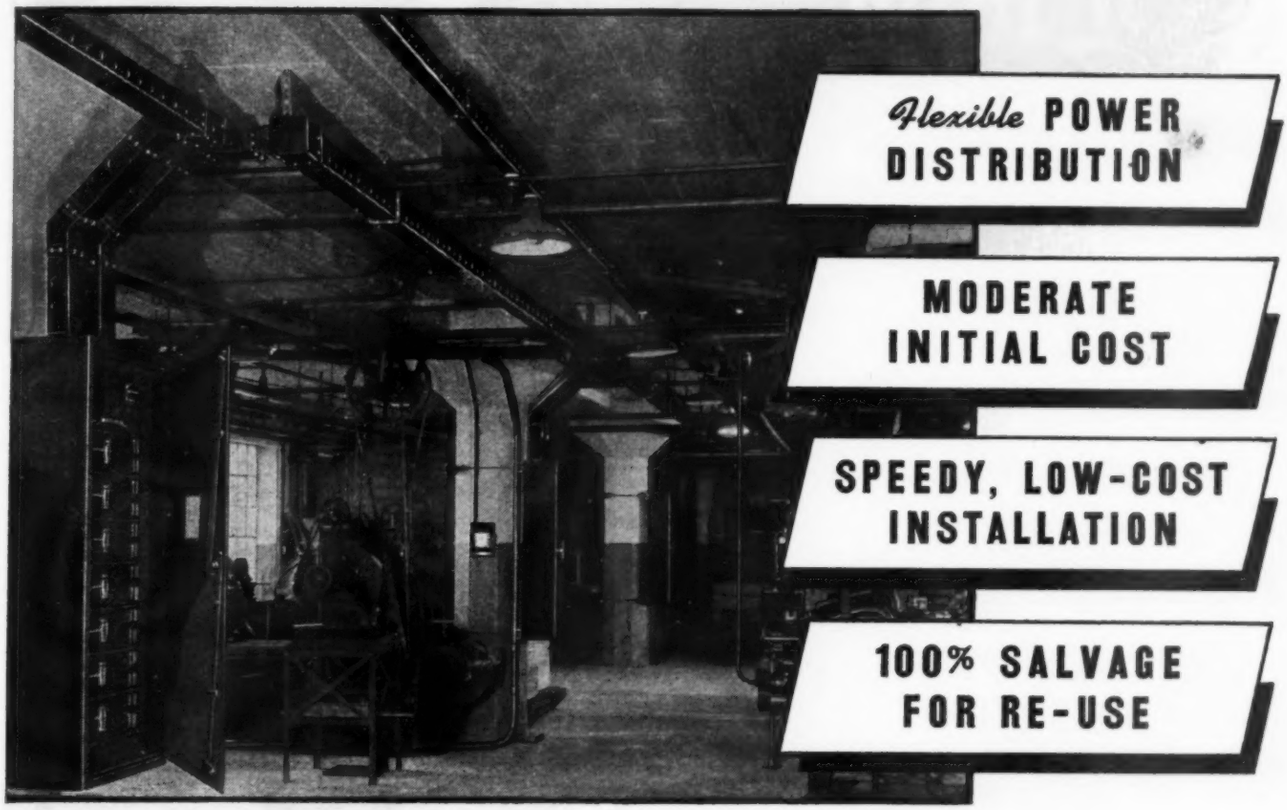


car doorways or stowed in corners against walls. An overhead fork is bolted to the lower fork's rear framework, and is adjustable to height of load. A chain extends from the outer end of the upper fork, and a hooked clamp on the end of the chain fits down over the edge of the load. Attachment can be applied to any fork truck. Elwell-Parker Electric Co., Cleveland.

ILLUMINATED MAGNIFIER

Combining magnification with illumination in single unit Magnalite is constructed for use in first aid rooms, and plant hospitals. Eliminates need for supplementary lighting, lenses, head reflectors, and face shields. Flexibility and fingertip control

SQUARE-Duct *offers...*

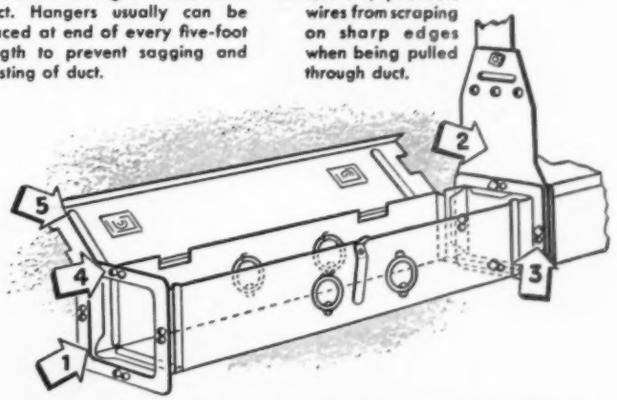


Power where you want it—when you want it—without buying or moving long runs of conduit.

That's why so many plants use SQUARE-Duct to carry feeders, branch circuits, and other groups of conductors. SQUARE-Duct saves time and money every time a machine is moved or a new one added. Knockouts every three inches along the duct provide complete flexibility of machine location. Circuits are easily accessible for inspection or maintenance.

The initial cost of SQUARE-Duct is comparable to that of conduit wiring. Installation cost is substantially lower. For complete details . . . call your Square D Field Engineer, or write Square D Company, 6060 Rivard Street, Detroit 11, Michigan, for Bulletin 6000.

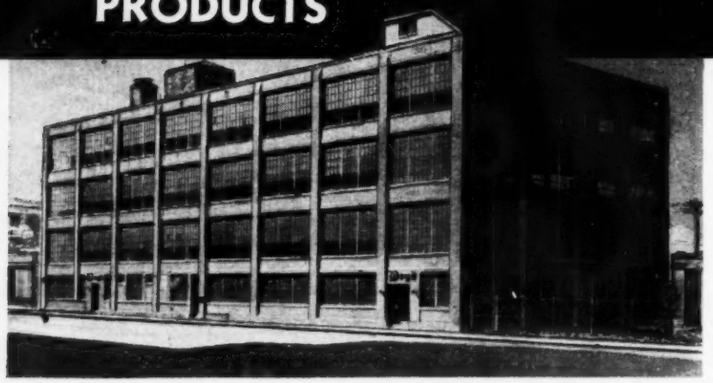
1. Drawn collar affords secure support for the duct and automatically aligns each length to prevent twisting. It also serves as a stable connection to the adjacent length equipped with a similar collar.
2. Notice how hanger fits securely between two lengths of SQUARE-Duct. Hangers usually can be placed at end of every five-foot length to prevent sagging and twisting of duct.
3. Hanger is bolted to both sides, top and bottom, affording even distribution of weight and offsetting any tendency to twist.
4. Double keyhole screw slots help in making alignment adjustments.
5. Emboss on cover, both sides and bottom, protects wires from scraping on sharp edges when being pulled through duct.



SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

The New Home of Lloyd PRODUCTS



Lloyd appreciates the patience and forbearance you have shown when overloaded manufacturing facilities slowed down delivery of Lloyd Flex-Loc Lamp Holders and Lloyd Automatic Starters. We are now at home in this large modern plant, where greatly increased facilities will make possible greater service to all our customers . . . service which we hope will match in quality the matchless Flex-Loc Lamp Holders and Lloyd Automatic Starters.

LLOYD POLICY INSURES QUALITY

651-F
FLEX-LOC Lamp Holder
Automatically self-adjusting. Engineered to fit ALL STANDARD spacings. POSITIVE AUTOMATIC LOCK. PERFECT ELECTRICAL CONTACT. Brass contacts grip BOTH sides of lamp pins securely.

Listed and Approved by
Underwriters' Lab., Inc., and
Canadian Standards Assoc., App. Division
E.T.I. Test Report 314454 Available
Patented—Other patents pending

FS-40
AUTOMATIC Starter
CUTS OUT deactivated or flickering lamps. CUTS OUT current to lamp and ballast. Increases life of lamp and ballast.

Listed and Approved by
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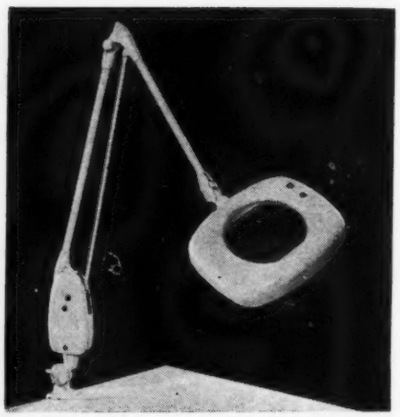
Certified by E.T.L., Spec. 6
Pat. Nos. 2200443-2228210

LLOYD PRODUCTS CO.
PROVIDENCE 5 RHODE ISLAND

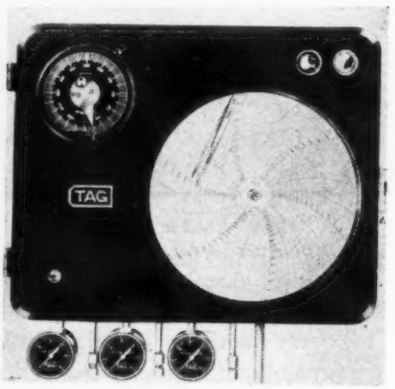
Branch Offices and Warehouse Stocks in 27 Leading Cities



are provided by floating arm, which supports the lens and lens mounting, and permits it to be placed in any position where it remains fixed and self-supporting. Illumination is furnished by two built-in fluorescent tubes mounted in the plastic head. Two models, a floor and a table mounting, in two different finishes, are available. The Haas Corp., Mendon, Mich.

RECORDER-CONTROLLER

Processing is controlled by pushbutton in automatic recorder-controller for temperature and pressure. By use of adjustable cam, timing starts automatically when the



temperature reaches the processing point, and is terminated at time set. All valves, whether steam, air, water, or overflow, are opened and closed as the process may require without manual attention. C. J. Tagliabue Div., Portable Products Corp., 624 Park Ave., Brooklyn 5, N. Y.

WATERPROOFING PAINT

Penetrating to the base of any material, a waterproofing, rust inhibiting chemical sets, and seals out all moisture, according to the manufacturer. The paint is claimed to be impervious to the action of acids, fumes, oil, tar, sun, rain, snow, and abrasion, and to be unaffected by heat or cold. L K R Chemical Co., Lafayette Bldg., Detroit 26.

PREFABRICATED DOOR

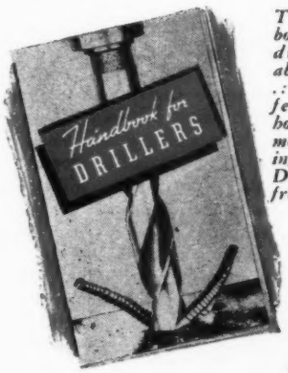
Where door space is inadequate, or where present doors require replacement, prefabricated vertical lift door can be quickly installed. The complete door structure is mounted on the outside wall of the build-

CLE-FORGE HIGH SPEED DRILLS

TRADE MARK REG. U.S. PAT. OFF

. . your assurance of HIGH QUALITY PERFORMANCE *at* LOW COST

Experienced machinists choose the tool that does the job *quicker* and *better.* Experience has taught them that CLE-FORGE High Speed Drills are not only the most satisfactory on every count, but actually cost less per hole. You cannot buy better drills . . . and no drills will give you lower costs.



This illustrated booklet answers hundreds of questions about Twist Drills . . . grinding, correct feeds and speeds, how to correct common errors in drilling, etc. Write to Dept. C for your free copy.

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The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
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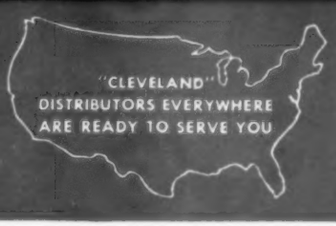
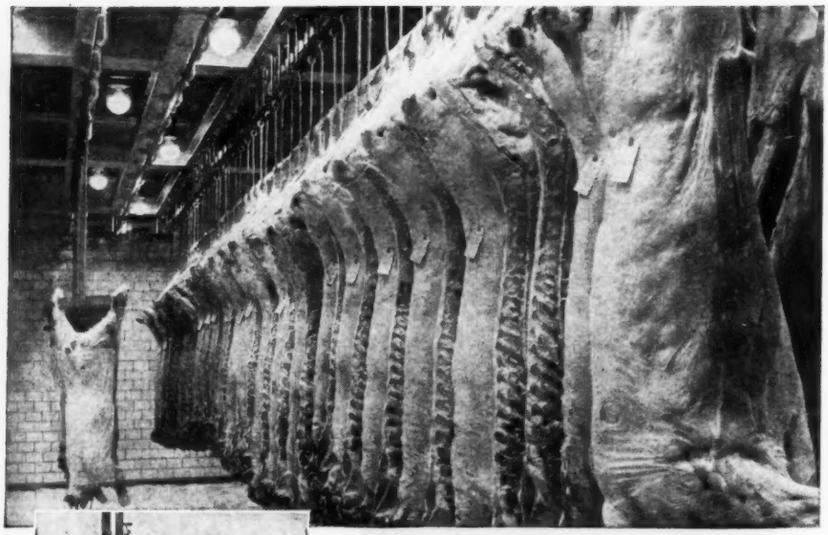
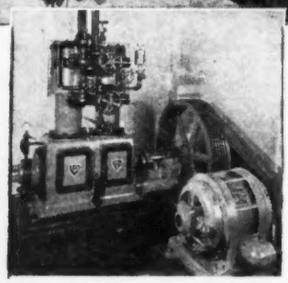
2929 EAST GRAND BLVD., DETROIT 2 • 1902 NORTH FIELD ST., DALLAS 1
E. P. BARRUS, LTD., LONDON W 3, ENGLAND







COURTESY THE CREAMERY PACKAGE MFG. CO., CHICAGO

SILICON BRONZE BOLTS

Vital to *Refrigeration*

Metrex Valve Company, Franklin Park, Illinois, specifies Harper Bronze Bolts for their dehydrators and strainers which dry refrigerant and remove sludge to assure efficient and uninterrupted freezer operation.

Thousands of carloads of perishable foods for home consumption—and for our good neighbor shipments abroad—require constant refrigeration to prevent spoilage and waste. The brunt of this refrigeration is borne by the sturdy freeze units made up of many components working in acid and moisture laden environment highly corrosive to common steel. Metrex dehydrators and strainers, and many other such parts depend upon the high tensile strength and acid and corrosion resistant properties of Silicon Bronze Bolts which can be easily removed for servicing and reused indefinitely.

A wide variety of fastenings made from Brass, Naval Bronze, Silicon Bronze, Monel and Stainless are available for prompt shipment from large Harper Stocks. Harper's Special Engineering facilities serve the Refrigeration Industry constantly.

The H. M. HARPER Company
2661 Fletcher Street
Chicago 18, Illinois

Branch offices: New York City, Philadelphia, Los Angeles, Milwaukee, Cincinnati, Dallas
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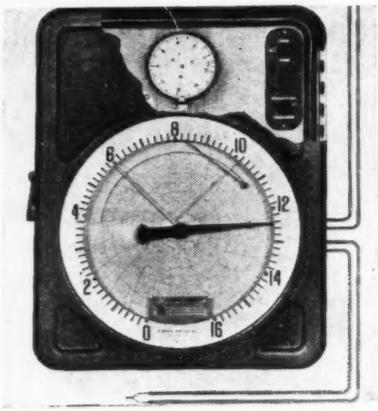
HARPER *Chicago*

ing, eliminating interference with overhead pipes, wires, or equipment. and without altering either building wall or original door space. The upper and lower sections traveling vertically are synchronized through gears to open or close fully at the same instant. When open it gives clear area around door jams for loading or unloading operations, and for entrance of vehicles. Fleming Steel Co., New Castle, Pa.

POTENTIOMETER-PYROMETER

Electronic potentiometer-pyrometer has no continuously moving or vibrating parts in its measuring circuit. It records one or two temperatures on a uniformly graduated chart, 12 inches in diameter, and indicates on a 29-in. scale which encircles recording chart. Instrument requires a 115-volt, 60- or 50-cycle, a.c. power supply. It operates from a thermocouple or from any source of d.c. potential which varies through at least 10 millivolts for full scale range. Conventional thermocouples are used for temperatures up to 3000 deg. F. For temperatures above 3000 deg. F., and for moving objects above 1500 deg. F., radiation type thermocouples are used. Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10.



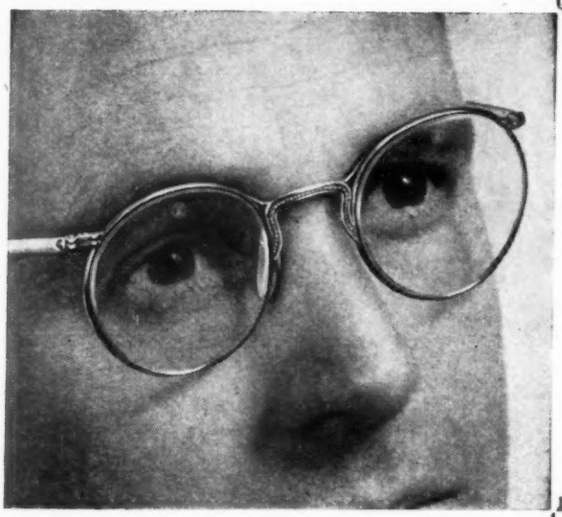
ALUMINUM ROOF PAINT

A reflecting, protective covering is formed by aluminum roof paint, providing longer life for the surface, and reducing inside temperatures by as much as 15 degrees. The paint is processed from a gilsonite asphalt base, and fortified with a processed pure aluminum paste. When the paint is applied, the aluminum pigment rises to the surface to form a foil-like, metallic shield. United Gilsonite Labs., Scranton 1.

DIELECTRIC HEATER

The 18X portable Red Head high frequency dielectric heating unit has an output of 1 kilowatt and raises the temperature of approximately 1 pound of average general-purpose material 170 deg. F. in one minute. With 16¼-in. width, it can be placed in between presses. Said to preheat preforms rapidly and uniformly, shortening molding cycles, and improving product quality. Also to minimize insert and pin breakage and to help to prolong the life of both the

the slightest eye-injury COSTS MORE



than the goggles that can prevent it

Typical records indicate that even the slightest of eye-injuries costs (in lost time, idle machine time and medical attention) approximately $15.00. The Society for the Prevention of Blindness estimates that *ninety-eight per cent* of these injuries can be prevented by the use of safety goggles (averaging in cost $1.50 a pair). What piece of plant equipment costs so little and returns its cost so many times?

Let your nearest A-O Safety Representative show you the *complete* story.

A-O Safety Goggles Safeguard the Eyes of Industry

American Optical COMPANY *Safety Division*

SOUTHBRIDGE, MASSACHUSETTS

BRANCHES IN PRINCIPAL INDUSTRIAL CITIES

LAMP COMPANY SAVES $15,000

"To change old type containers to those assembled by wire stitching, one Acme Silverstitcher was custom-installed. Now our entire sealing system is converted . . . $15,000 saved annually in material alone."

USE THE CLOSURE COMBINATION THAT

SLASHES SEALING COSTS

SilverStitch™ — SilverStitchers™

BOX STITCHING WIRE

- Always manufactured uniform in width and gauge
- Makes stronger, surer closures than other methods . . . unaffected by weather
- One-piece, continuous length, 5 and 10 pound coils . . . cuts loading time
- Galvanized to resist rust

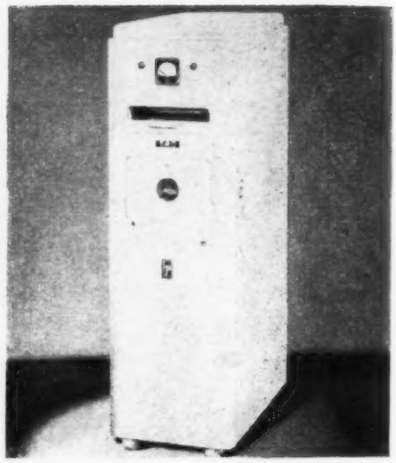
BOX STITCHING MACHINES

- Operate easily and smoothly
- Heavy duty construction, low power consumption . . . for long, thrifty service
- Few moving parts . . . vital ones reversible . . . for low maintenance costs
- Adjustable, single pedal, foot-rest treadle control

SEALING SHIPPING CONTAINERS BY STITCHING IS FASTER, STRONGER, AND MORE ECONOMICAL

ACME STEEL COMPANY

NEW YORK 7 ATLANTA CHICAGO 8 LOS ANGELES 11



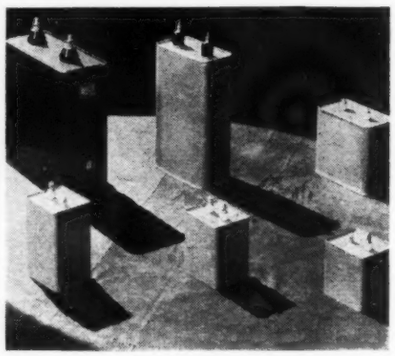
press and mold. Control is automatic. There is no starter button to push. The Girdler Corp., Thermex Div., Louisville.

NON-SLIP COATING

Synthetic plastic anti-slip coating, named Flintred, can be applied by trowel over steel, concrete, aluminum, galvanized iron, hard tile, and wood floors. On clean steel it serves as a corrosion-resistant protective coating in addition to skid-preventing. The material is described as resistant to water, gasoline, oil, alcohol, ordinary fats, and grease. Manufacturer recommends it for periodic application to worn floor areas that become unsafe underfoot when wet from water, oil, or similar hazards. The Flintkote Co., Industrial Products Div., 30 Rockefeller Plaza, New York 20.

CAPACITORS

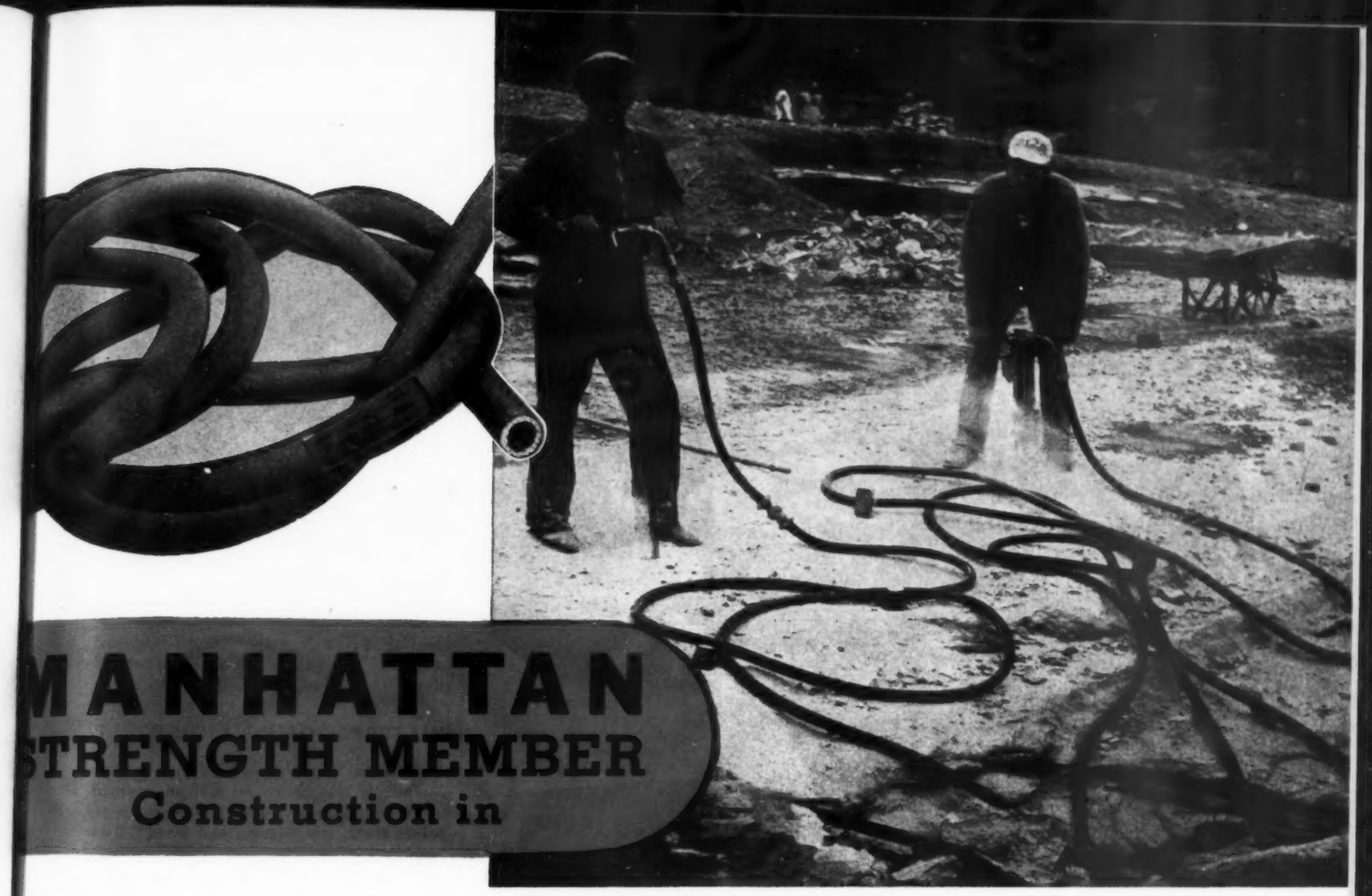
Line of small, lightweight, d.c. Pyranol capacitors for use in light-metal welders and applications requiring fast discharge,



is announced. Available in a range of ratings, with ambient temperature operating limits at rated voltage ranging from 0 to 50 deg. C., and capacitance tolerances at 25 deg. C. of plus or minus 10 percent. General Electric Co., Schenectady 5, N. Y.

TRUCK BATTERY CHARGER

Automatic two-rate industrial truck battery charger is designed to provide rapid, unattended charging for either lead-acid or Edison type batteries. The charger, known as FTR 9202-AS, plugs into 105–125-volt, single-phase, 60-cycle a.c. supply line. It



MANHATTAN STRENGTH MEMBER Construction in

Condor HOMO-FLEX HOSE

as these

10 ADVANTAGES

- Extreme flexibility - easy to handle
- Resists kinking
- Light in weight
- Practically inseparable cover and plies—balanced homogeneous construction
- Withstands high pressures and surges with wide margin of safety
- Uniform inside diameter
- Less elongation and expansion
- Less fatigue to operator
- More production
- Lower ultimate cost

An outstanding Manhattan development in hose construction makes Homo-Flex a lighter, more flexible, longer lasting hose in every service for which it is styled. The coiled length illustrated shows how easily Homo-Flex will take the turns and twists, as workers whip it around. Homo-Flex hose does not writhe or coil under pressure. Delivers unusually long service, even under the destructive effect of rapid pulsations of pressure due to Manhattan's development of Homo-Flex Strength Member design and construction. Flexlastics throughout—plus Turnate Vulcanization—insures longer resistance to natural wear.

Men prefer Homo-Flex because it's a quicker, easier-handling, energy-saving hose—"de-bulked," yet strengthened and streamlined for modern methods.

Homo-Flex Hose styles for

Air, Air-Oil, Water, Steam Pressing Iron,	Orchard Spray, Oil Spray,	High Pressure Mine Spray,	Butane Propane for Tank Truck Deliveries

The term FLEXLASTICS is an exclusive MANHATTAN trade mark. Only MANHATTAN may make FLEXLASTICS.

RAYBESTOS-MANHATTAN, INC.

MANHATTAN RUBBER DIVISION

EXECUTIVE OFFICES AND FACTORIES PASSAIC, NEW JERSEY

FOR ALL TYPES OF PACKAGE MACHINERY

3 IN 1 ELECTRONIC

PRECISION CONTROL OF REGISTRATION

SCANNER MODEL
No. 8232
Approx. size: 7½" x 4" x 3¾"

A small, rugged, compact, one-piece, triple scanner easy to install, which will regulate cutting of printed paper, cloth, cellophane, tinfoil and similar materials of any color, or combination of colors with precise relation to position of printed matter.

A turn of a switch gives:

(1) Transmitted light for use with transparent material.

(2) Reflected light for use with opaque material.

(3) Both transmitted and reflected lights for use with translucent material.

AMPLIFIER MODEL
No. 8233
Approx. size: 10¾" x 8¼" x 5¼"

Color variety is no problem. A set of internal color filters eliminates the need for synchronous selector for use where registration mark is a color contrast in the printed design.

Amplifier can be installed anywhere within 25 feet of scanner. Includes heavy duty relay rated at 30 amps. 110 v. inductive load and 50 amps. 110 v. non-inducive load contained in a sturdy steel housing. As is customary with all of our controls, a large safety factor is incorporated in all components. Made for 110 v. and 220 v.

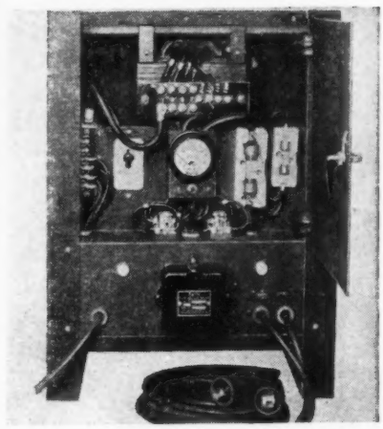
Write for Catalog #8231

RIPLEY Company, Inc.

INDUSTRIAL CONTROLS DIVISION

(FORMERLY UNITED CINEPHONE CORPORATION)

NEW LITCHFIELD STREET TORRINGTON, CONNECTICUT



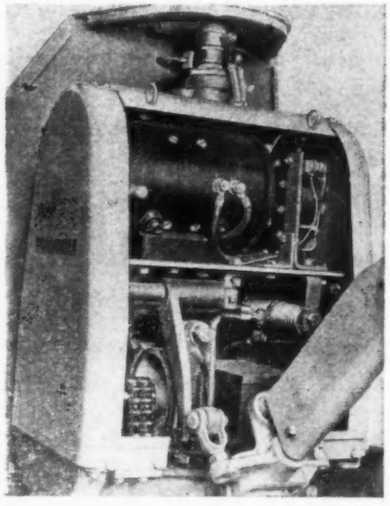
charges 6-cell, 250-amp.-hour, lead-acid batteries to their full capacity in 8 hours, and the 10-cell, 250-amp.-hour Edison batteries in 7 hours. Charging rate is closely controlled to prevent overheating, purging of plates, and excessive gasing. Unit makes use of a single-phase, bridge-connected selenium rectifier. Federal Telephone & Radio Corp., Newark, N. J.

WATERPROOFING LIQUID

Transparent liquid is said to penetrate so completely that when brushed or sprayed on it permanently waterproofs concrete, brick, stone, tile, stucco, and wood. Two coats are required for normal applications; three in cases of extreme pressure seepage. Comes in 1- and 5-gal. cans, and in 30- and 55-gal. drums. National Hydrozo Co., 5234 St. Clair Ave., Cleveland 3.

ELECTRIC HAND TRUCK

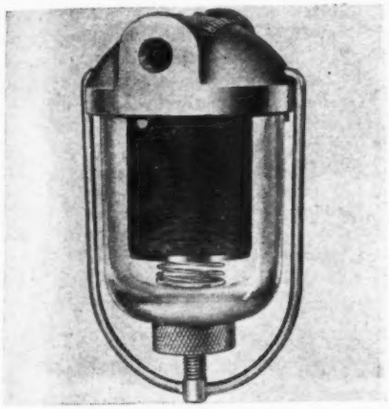
Electric-propelled hand truck features hydraulic lift pump which, maker states, reduces by two-thirds the time necessary to get load into moving position, and a redesigned brake four to five times as powerful as that on manufacturer's previous model Transporter. One stroke on lift pump engages loaded skid with standard 1-in. clearance. Low-pressure (high-speed) cylinder for raising platform into contact with skid or pallet is combined with high-pressure (low-speed) cylinder for raising the load. When platform encounters the



load resistance, fluid from low-pressure cylinder bypasses back into reservoir, and the high-pressure cylinder raises the load. The new pump is interchangeable with the old. Brake is applied automatically by release of guide handle, and brings fully loaded truck to an immediate stop even on grades up to 10 percent. Automatic Transportation Co., 149 West 87th St., Chicago.

GASOLINE PURIFIER

Separating free water from gasoline, purifier passes gasoline or other fuel between layers of helically wound ribbons made from impervious material. Dirt and other impurities are stopped at outer edges of



the ribbons and fall into sediment chamber. Accumulations on outer surface of the ribbon cylinder occurring after long use can be cleaned off by blowing compressed air, or even the breath, into the cylinder, known as Kwick Klean Kartridge. The purifier can be used on cars, trucks, buses, tractors, stationary engines, and fuel oil burners. Skinner Purifiers, Inc., Detroit 11.

ELECTROLYTIC CAPACITOR

Type ETW electrolytic capacitor comes in a molded bakelite casing, designed for mounting with a clip-type bracket for motor starting applications. Capacity range

is from 25 to 450 microfarads in four container sizes. Cornell-Dubilier Electric Corp., South Plainfield, N. J.

DOOR OPERATOR

Suitable for single sliding doors, level or inclined track, pneumatic door operator with speed adjustment screws can be coupled to remote controls to open doors without delay for passage of trucks or personnel. Controls and interlocks are available to isolate hazardous areas, or

SAFETY FOR HURRYING FEET!

BLAW-KNOX
ELECTROFORGED
GRATING and STAIR TREADS

The combination of one-piece electroforged grating and rolled diamond checkered nose-plate provides stair treads which withstand terrific impact... This feature is especially important as it assures safe footing on catwalks and engine room grating.

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- flash- and projection-welder dies
- extruded and drawn rounds
- plus many others

RW-4A

Controlled quality and uniformity eliminate costly production losses

This Hydromatic, spot-welding grille bars to a grille frame at the rate of some 100 assemblies per hour, demonstrates that the controlled quality and uniformity of Ampco spot-welding electrodes result in increased production and lower cost for you.

At Ampco, all resistance-welding products comply with RWMA specifications. Control of quality and uniformity — both absolutely necessary in this exacting field — are kept under close supervision of laboratory technicians throughout the entire production cycle.

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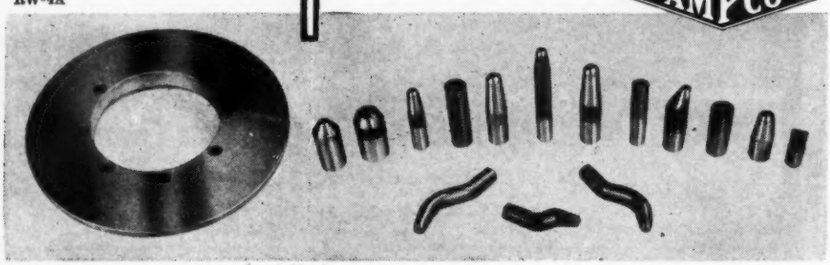

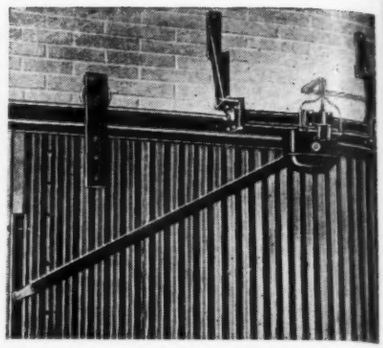

for connecting operator with fire detection equipment. Unit conserves heat and conditioned air. Operates at air pressures of from 80 to 100 pounds. Supplied in packaged kits consisting of operator, wall brackets, operating arm, and door slide. National Pneumatic Co., Industrial Sales Div., Rahway, N. J.

FOUR-WAY AIR VALVE

Hand-controlled 4-way operating valve for compressed air is of full-ported poppet type, but has only two poppets. All ports are on one face with both outlet connections at one end to facilitate piping; unit

has no stuffing boxes or springs. All working parts are contained in the upper housing, to permit permanent installation. Whenever servicing is required, part containing the mechanism can be lifted from the permanently fixed base by removing four socket head screws. Identified as H-4 series, valves are available in six pipe sizes from ¼ to 1¼ inches, locking or non-locking. Numatics, Milford, Mich.

LAWN MOWER

Cutting and trimming a lawn in one combined operation, 30-in. rotary power lawn mower covers half an acre an hour. The horizontal rotary blades, whirling at high speed, reach up to the edge of posts, trees, fences, and other obstructions. Mower is designed to cut all grasses or weeds, regardless of height, and to eliminate grass-matting and overlapping runs, since the wheels are behind and well inside path of cutting blades. Has fingertip steering, and handle can be collapsed and folded for winter storage or for transportation. The four cutting blades of heat-treated, shatterproof steel are double-edged, and

Maneuverability

I want a LEWIS-SHEPARD every time..... they save aisle space that has cost me real money to build!

You can PROFIT-PLAN YOUR AISLES best with L-S Fork Trucks

ELECTRIC POWER in 2000 or 3000 or 4000 LB. CAPACITY

Turning corners is easy . . . but maneuvering in minimum aisle width is what counts. It has been thoroughly demonstrated on the job that L-S Fork Trucks can right angle pile in 12-foot aisles. Statistics show storage floor space today costs $5–$7 per square foot to build. So, remember . . . it always pays to ask: How wide an aisle must I pay for in order to use that truck? You can PROFIT-PLAN YOUR AISLES best with Lewis-Shepard Fork Trucks.

Write immediately for latest facts, literature, catalog.

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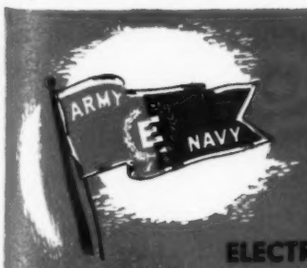
Representatives in principal cities (Lewis-Shepard) ***Consult your phone book***

TRADE MARK



HYDRAULIC HANDLIFT TRUCKS

SINGLELIFTS JACKLIFTS SKIDS STACKERS

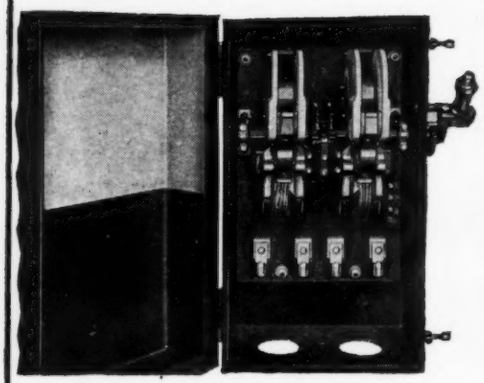
PALLET TRUCKS PALLET STACKERS PRODUCTION LIFTERS

CRANES RACKS PALLETS FLOOR TRUCKS HAND TRUCKS

ELECTRIC, GAS-ELECTRIC AND GASOLINE POWERED FORK TRUCKS

Now--two more sizes of this

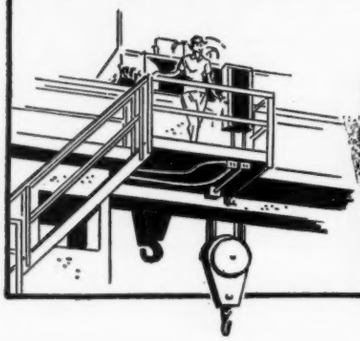
new **Safety Disconnect Switch for D-c Cranes**



1 Manual-magnetic type for ease of operation.

2 LINE-ARC design for high arc-rupturing ability.

3 Designed with parts associated with crane control to reduce the replacement-part problem.



Safety rules in many industrial plants and laws in several states require a safety disconnect switch on overhead traveling cranes, mounted at the point where the operator enters or leaves the crane. These switches disconnect the crane from the main collector power-feeders running along the crane runway. Previously, operators, especially women, have had difficulty in opening and closing disconnect switches of the manually operated type.

This new EC&M *Magnetic Type* Disconnect Switch meets all the requirements of ease of operation, safety, convenience and reliability. It is of double pole design, completely enclosed and has side-type, externally-operated handle with thumb-latch which holds handle in either open or closed position.

Pushing the handle up closes the switch, pulling it down opens it—a cam roller forces contacts open, if necessary, and also insures against accidental closure due to vibration or an impact blow from another crane on the same runway. It allows for up to three padlocks for locking switch open.

E&M

New publication 1024, just issued, gives complete data on ratings, sizes, dimensions, etc. Copy will be mailed promptly upon receipt of your request.

THE ELECTRIC CONTROLLER & MFG. CO.

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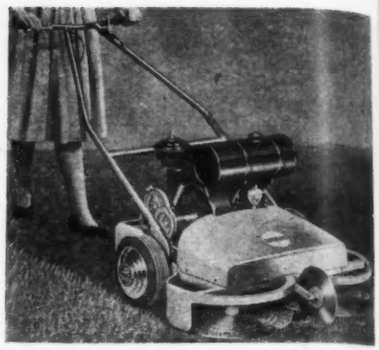
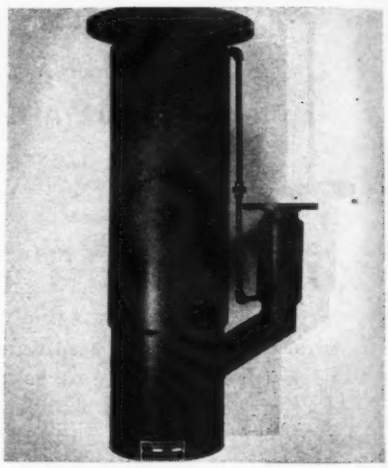


removable, for sharpening and replacement. John A. Roebling's Sons Co., Trenton, N. J.

DIFFUSION PUMP

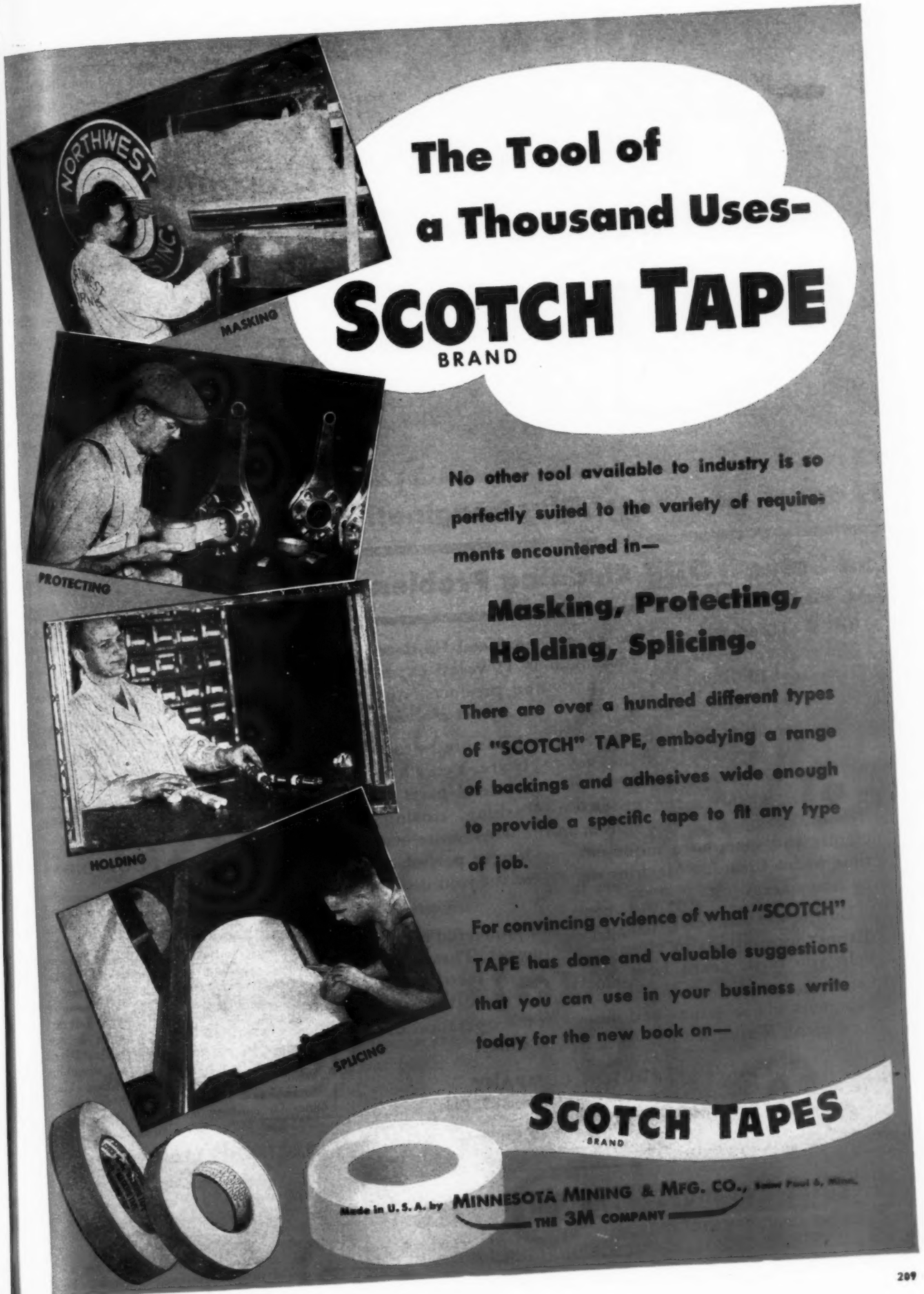
All-metal 10-in. diffusion pump, known as Type H-10, has a capacity of 3000 c.f.m. from 2×10^{-3} to 10^{-5} mm. of mercury. It operates against a forepressure of 450 mi-



crons and blanks off at 10^{-6} mm. of mercury. Outgasing and corrosion are said to be minimized by stainless steel casing. Suitable for applications in industrial processing in the micron pressure range and below. National Research Corp., 100 Brookline Ave., Boston 15.

THERMOMETER

All metal, welded thermometer is said to have an accuracy of 1 percent of scale range, which is unaffected up to 50 percent above the 500 deg. F. range, and 10 per-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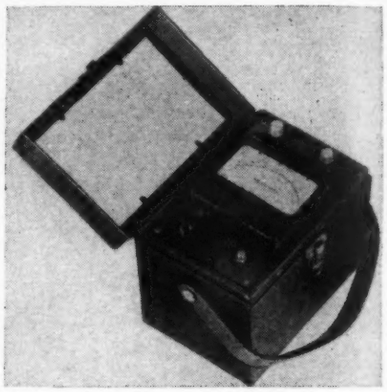
cent above 750 deg. F. range. Dial sizes are 3 and 5 inches. Thermometer has 18-8 stainless steel stem and mounting nut, which are resistant to all but a few acids. Pointer is fixed to stainless steel shaft, the shaft directly to coil. There are no gears. Mounting nut, a ½-in. standard pipe thread, is welded to stem for most pressure uses. End plug, also stainless steel, is welded to stem. Stem is ¼-in. in diameter, and immersion is 2 inches for liquid, or 4 inches for gas. W. C. Dillon & Co., Inc., 5410 West Harrison St., Chicago 44.

INSULATION RESISTANCE METER

Portable, self-contained insulation resistance meter tests to 50,000 megohms (center scale 1200 megohms). The testing unit, Model 261 Vibrotest, has own power supply—two No. 6, 1½-volt dry cells providing



500 volts. Hand-stepped scale calibrates at infinity, maintaining its accuracy at the high value part of the scale, maker says. It has a high voltage regulator in measuring circuit, and is equipped with condenser charging circuit to facilitate fast testing of condensers or capacity circuits. Housed in weatherproof metal case with strap. Associated Research, Inc., 231 South Green St., Chicago 7.

WATERPROOFING COATINGS

Waterproofing paint, called Sealit, containing DDT, is made to seal dampness out of walls, waterproofing and preserving them in one operation. Can be used in interior and exterior surfaces, above or below grade. Comes in white, ivory, buff, light gray, battleship gray, and other colors. A waterproofing liquid for use on all masonry surfaces, floors, and walls, both interior and exterior, old or new, painted or unpainted, damp or dry, also contains DDT. It is claimed also to be dustproof, crumbleproof, and acid- and grease-resisting. Can be used as a prime coat, as well as a hardener for concrete floors. Sealcrete Corp., 1047 East 46 St., Brooklyn 3, N. Y.

ELECTRONIC RELAY

Utilizing the hot cathode thyratron principle, electronic relay is for use in electrical control circuits. Characteristics claimed are high load contact capacity, suitability for photo-cell circuits, for direct controlling actuation of motors, valves, alarms, for motion and limit control within micro-inches

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WELDED STEEL PRESSES

Weldments fully stress-relieved

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If getting prompt delivery of a new press is holding up your production program, you will be interested in how Warco is helping scores of metal fabricators.

Exceptionally large engineering and production facilities enable us to deliver the press you need much sooner than many other manufacturers.

Warco presses are the most modern welded steel presses made, offering advantages that experience has shown are most desired by press users. They're engineered specifically for greater rigidity, accuracy, strength, power and endurance.

Warco's experienced press builders give personal attention to your specialized problems. Your inquiry will receive prompt attention. We invite you to inspect our plant, the largest of its kind in the world.

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Warco open back inclinable presses are especially suited to all light work. Capacity range from 50 to 200 tons, stroke range from four to 14 inches. Single-geared, electrically controlled, with latest type of friction clutch and brake unit.

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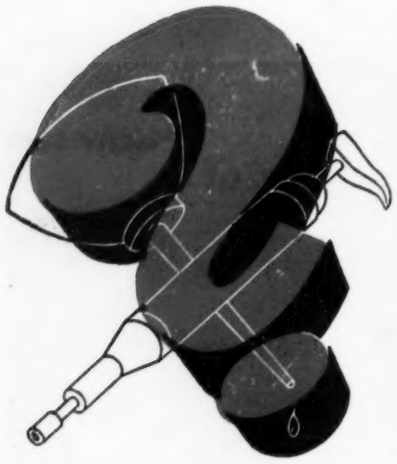

GREASE OR OIL

The question of selection of the proper type and consistency of lubricants need offer no problem. LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest grease types. All reduce friction and wear, protect against rust and corrosion, and are more economical than conventional lubricants. Let us prove our case.

℞ FOR YOUR MACHINERY

No. 3 — Ideal for general oil type lubrication, ring oiled bearings, wick feeds, sight feeds and bottle oilers.
No. 8 — Because of high film strength and long life it reflects outstanding performance in most types of enclosed gears (speed reducers).
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BALL BEARING — This is the LUBRIPLATE Lubricant that has achieved wide acclaim for use in the general run of ball and roller bearings operating at speeds to 5000 RPM and temperatures up to 300 degrees F.

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FIT THE LUBRICANT TO THE JOB

The operation of all types of machinery is dependent upon lubrication and to assure satisfactory operation, bearings, gears, cams, chains and other moving parts must be lubricated with a lubricant that "fits the job."

Equipment Manufacturers increasingly realized the extreme importance of proper lubrication, so most often included the appropriate lubrication system in their construction design. When no special lubricating devices are incorporated in the machine design, manufacturers will generally specify, with accompanying literature or tags, just how and with what type product the lubrication is to be performed. There remains for the equipment user however, to consider his own individual operating conditions as a basis for selecting the proper *type* oil or grease that will have all the necessary properties required for assuring satisfactory lubrication.

In choosing an oil, operating Speeds and Temperatures are the most determinant factors. High speeds require light bodied oils; high temperatures require a heavy oil that will retain its film strength and will not be dissipated to a watery consistency in the presence of considerable heat, and shall possess high flash and fire points. Likewise the choice of grease will depend on Operating Speeds, Temperatures, Loads, and the possible presence of water, acid, or dust conditions. High Speeds require a light to fluid grease; high temperatures require a medium to heavy grease. For heavy loads, medium to heavy greases, and preferably enhanced by an extreme pressure additive, are most suitable. However, today's trend is leaning toward multi-purpose lubricants.

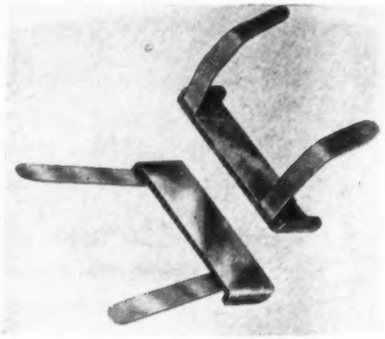
LUBRIPLATE lubricants were developed to "fit the job." Whether grease or oil is required there is a LUBRIPLATE product to meet every lubrication demand. LUBRIPLATE arrests progressive wear and protects against rust and corrosion. Because LUBRIPLATE is endowed with special qualities not found in ordinary lubricants, it is well able to meet the modern demands of higher speeds, heavier loads, and extremes of heat and cold, to the utmost satisfaction of its many users.

A copy of "THE LUBRIPLATE SERVICE HANDBOOK" containing valuable information on the subject of lubrication will be furnished without charge by writing Fiske Brothers Refining Company, Newark 5, N. J. Ad

on wire stranding machines, automatic feed equipment, precision grinding and gaging, and limit switch guidance of material fed to production machines. Relay is snap-acting, and trips by either an external contact carrying 3 microamperes, or any external circuit whose value drops to 1 megohm pure resistance. Operates from 110-volt, 60-cycle a.c. lines. Automatic Temperature Control Co., 34 East Logan St., Philadelphia 44.

VISE JAW CAPS

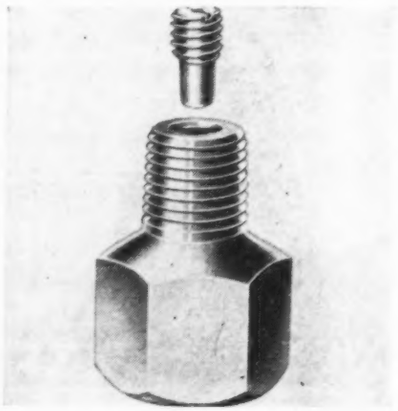
Copper, brass, or plastic vise jaw caps are offered in seven different sizes, ranging from mill bars, provide smooth, soft sur-



faces without any hard spots, to grip all classes of finely finished work. Plastic caps are suitable for finely finished soft metal surfaces. Gregory Tool & Mfg. Co., 5300 Tiremand Ave., Detroit 4.

CARTRIDGE SNUBBER

Snubber damps pulsations by the use of powdered metal through which the pressure medium must pass. The compressed



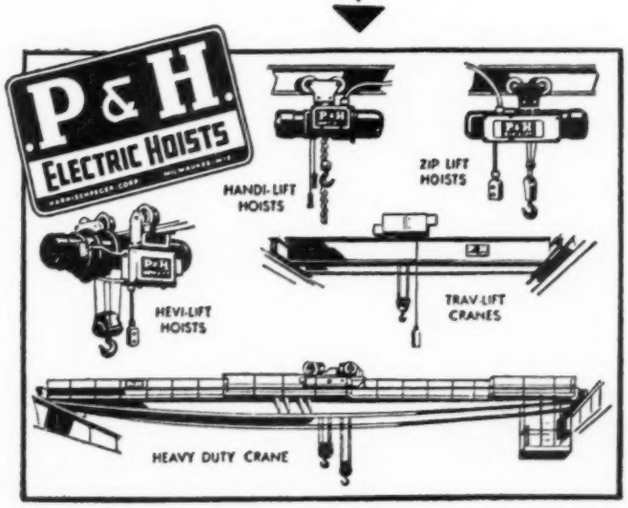
STORAGE IS NO PROBLEM

when you move parts "THRU-THE-AIR"

In and out . . . up and down . . . on and off of shelves. Only with "Thru-the-Air" handling can you make *all* these moves with a minimum of time, effort and floor space.

A minimum of time because your loads move *direct* —without rehandling. A minimum of effort because electric power does all the work—the operator merely pushes buttons. A minimum of floor space because loads move "Thru-the-Air," without congesting aisles.

In the P&H Zip-Lift, a modern wire rope electric hoist, you get all the advantages of "Thru-the-Air" handling at a price soon repaid out of savings. Use it on hook, jib, or trolley—just hang it up, and the Zip-Lift is ready to go! For free details, ask for Bulletin H20-1.



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TODAY, The "Machine of Tomorrow"—THE GENERAL 105
Designed and Built To The Specifications Of 30,000 Crane Users
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MOUNTED ON RUBBER!
CRANE, SHOVEL, CLAMSHELL OR DRAGLINE!

• More work, in less time and at lower cost, means more jobs and more profits! With the General 105, jobs are completed on time and right because these husky units are built to turn in record performances on *all types of jobs,* including most of those you couldn't handle in the past.

The General 105, for example, was designed and built to meet the requirements of 30,000 crane users . . . men who know crane operation told the men who know crane design and construction what they wanted . . . and in the General 105, they've got what they asked for!

Write today for your copy of the "105 Comparison Folder" . . . it's packed with facts of interest to every crane user. Address The General Excavator Company, Marion, Ohio.

ONE-MAN CONTROLLED • ONE-ENGINE OPERATED • RUBBER-TIRED

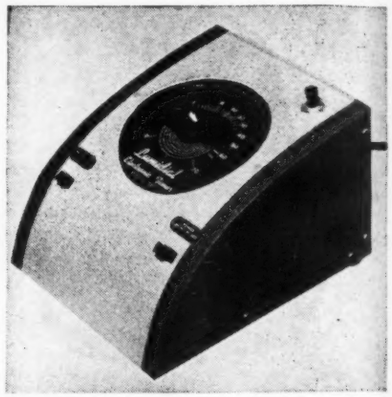
THE OSGOOD CO. MOBILCRANES — THE GENERAL EXCAVATOR CO. SUPERCRANES

MARION, OHIO

powdered metal is in the form of a cartridge, which can be inserted directly in the gage socket, or in a small separate connecting piece attached to gage socket. Made in various porosities for air or gas, for water or steam, or for oil. Helicoid Gage Div. of American Chain & Cable Co., Inc., Bridgeport 2, Conn.

ELECTRONIC TIMER

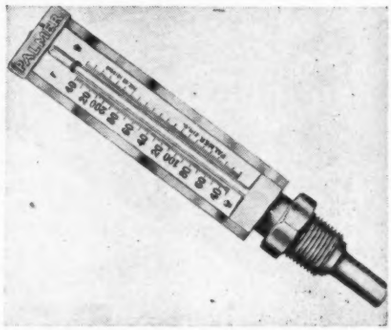
Stepless rheostat in thyratron-fired electronic timer permits settings at any interval from 0 to 60 seconds. Dial calibrations are spread below 1 second to allow in-



creased accuracy, and plug-in multipliers can extend the setting interval up to 30 minutes. Said to operate relays and light wattages up to 500 on 110-volt, a.c. or d.c. circuits. Assembly Products Co., Chagrin Falls, Ohio.

THERMOMETER

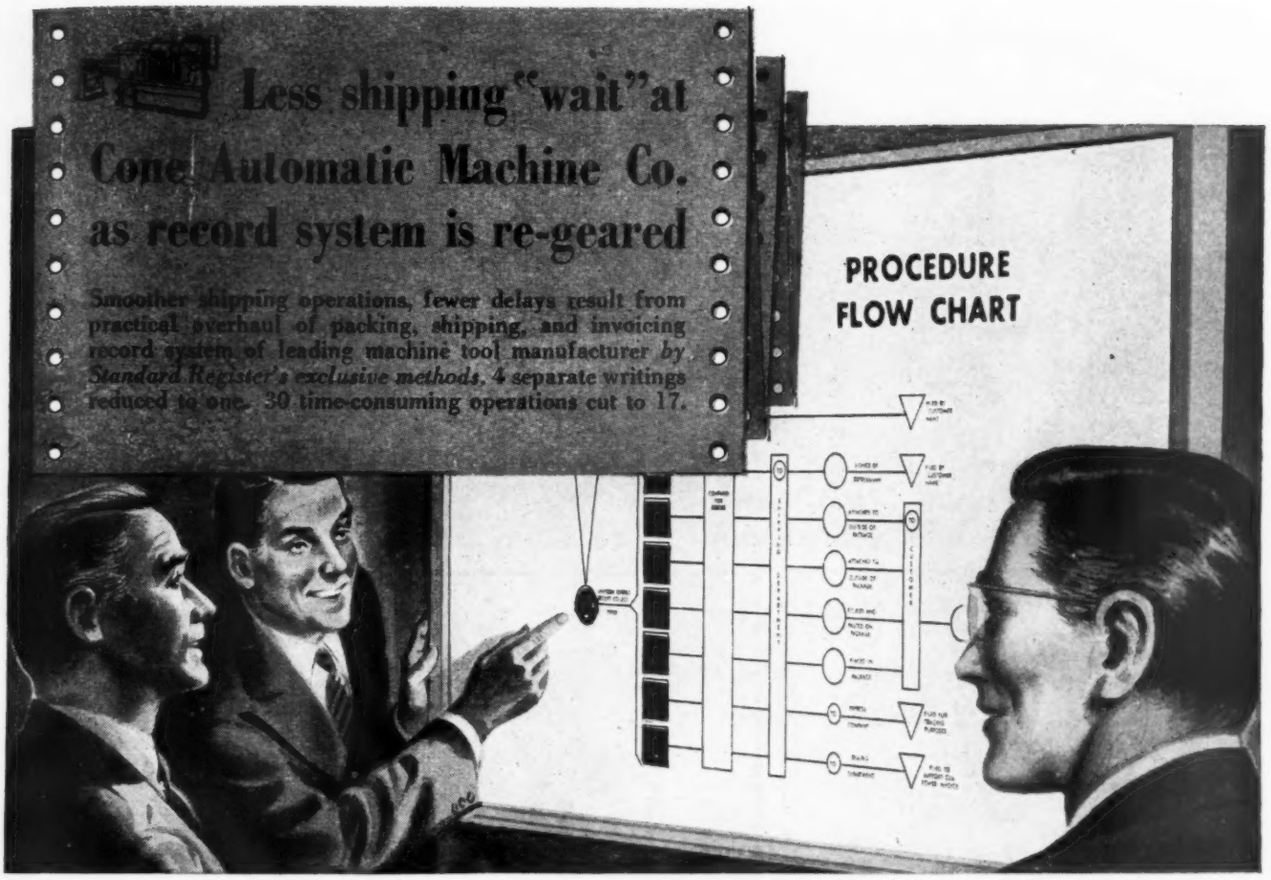
Non-breakable Plexiglas shield on industrial thermometer can be removed for cleaning.



Mounted in an extruded brass case with nickel finish, thermometer has a 4-in. reading scale calibrated from 40 to 240 deg. F. Palmer Thermometers, Inc., Cincinnati 12.

DISCONNECT SWITCH

Designed for use in conjunction with static eliminators and with meters on high voltage switchboards, solenoid-operated disconnect switch is announced. Plunger-type rod is actuated by solenoid on top of mounting box, and is guided by a hole in the bottom of the box. Line terminals are porcelain-mounted brass posts, on 1½-in. centers. In closed position, contact is made by a brass disk held against contact posts by a compression spring; when open, disk drops ¾ inch below terminals, providing


Less shipping "wait" at Cone Automatic Machine Co. as record system is re-geared
Smoother shipping operations, fewer delays result from practical overhaul of packing, shipping, and invoicing record system of leading machine tool manufacturer *by Standard Register's exclusive methods.* 4 separate writings reduced to one. 30 time-consuming operations cut to 17.
PROCEDURE FLOW CHART

And Standard Register's exclusive procedures save most where record systems cost most

IT'S IN THE WRITING and handling of forms—*and in how they function*—that waste finds the best hiding place. And it's here that Standard Register's scientific approach so frequently reveals sources of savings that escape the usual office or systems study. Savings which multiply themselves all over again through better management control.

In predetermined basic steps—including analytical flow-charting of existing methods—Standard Register's exclusive approach turns a revealing spotlight on ineffective control procedures, work-making form design, time-consuming methods of writing and handling forms.

And in a minimum time, without upsetting office routine, Standard Register is ready with specific recommendations—the kind that have effected five and six figure savings for many leading companies.

Would you like additional facts about Standard Register's business systems—and the Formcraft-Designed Kant-Slip continuous forms that furnish you with better *working papers?* Write for Formcraft Digest D-190 which explains the above system.

PROBLEM: FIND THE AREA WHERE SAVINGS COUNT MOST

Cost of printed forms: Savings as high as 10% in this area (because of difference in quality of paper, carbon, etc.) are relatively small. A few hundred dollars *at most.*

Cost of completed records: A 10% saving in the cost of writing, handling and using forms is 10 to 50 times greater, often runs into four figures.

Cost of the business operation, controlled by written systems: In this area, savings may multiply themselves into almost incalculable figures—through better management control.

THE STANDARD REGISTER COMPANY

Manufacturers of Record Systems of Control for Business and Industry

307 CAMPBELL STREET, DAYTON 1, OHIO

Pacific Coast: Sunset McKee-Standard Register Sales Co., Oakland 6, California. Canada: R. L. Crain Limited, Ottawa. London: W. H. Smith & Son, Ltd.

CM HOISTS

68 Years of experience really means something

COMET light weight electric hoist. Capacities from ⅛th to 1 ton.

METEOR heavy-duty electric hoist. Capacities from ½ ton and up.

CYCLONE 12 bearing high speed hand hoist. Capacities from ¼th ton and up.

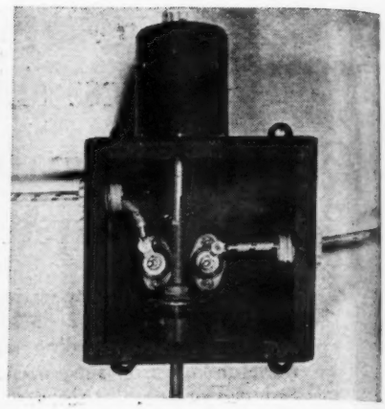
Since 1876 Chisholm-Moore has been providing industry with many types of overhead materials handling equipment. These years of experience combined with "service-thinking" engineering skill are reflected in the operating efficiency, durability, economy and safety features of all CM materials handling equipment...Hand Chain Hoists, Electric Hoists, Monorail Trolleys, Traveling Cranes, CM Puller (for horizontal pulling) and other CM equipment are fully illustrated and described in Catalog 1944. You'll find the information most helpful. Write us today for a copy.

CHISHOLM-MOORE HOIST CORPORATION

(Affiliated with Columbus-McKinnon Chain Corporation)

GENERAL OFFICES AND FACTORIES: 130 Fremont Ave., TONAWANDA, N. Y.

SALES OFFICES: New York, Chicago and Cleveland



two ¾-in. air gaps in series. According to the manufacturer, the switch will open a line carrying 100 milliamperes of 60-cycle a.c. and a voltage of 10,000 volts above ground. Solenoid operates from a 115- or 230-volt, 60-cycle a.c. circuit. The Simco Co., 4929 York Road, Philadelphia 41.

PUMP

Equalized Roto-Blade pump is designed for working pressures to 1000 p.s.i. continuous or 1500 p.s.i. intermittent. Available as a single pump, double pump, single pump with feed pump, double pump with feed

pump, and a single pump with gear pump. Capacities range from 8.5 to 50 g.p.m. Manufacturer states that bearing loads are neutralized by equalized and diametrially opposed radial hydraulic thrust loads, and that the impeller assembly, which includes the bushing and all moving parts, may be readily removed for servicing or replacement. John S. Barnes Corp., 301 South Water St., Rockford, Ill.

FLEXIBLE SHAFT TOOL

Portable flexible shaft utility tool weighing 8 pounds can reach small corners and tight places. The 1/15-hp. motor can be hung on any convenient hook and connected to an outlet. Tool is equipped with a No. 0 balanced Jacobs chuck to handle all drills, grinding wheels, buffers, and countersink bits with shanks of ⅛ inch in diameter or less. Shaft is 36½ inches long, and normal speed for the handpiece is 500 to 3000 r.p.m., at gear reduction end. If desired, power may be taken off the other end of the motor for direct drive

How can they COUNT on the thickness of a sheet of steel?

FROM HIS PULPIT, this rolling-mill operator can see at any moment whether there is any variation . . . *even down to 0.0001"* . . . in the thickness of the steel sheet passing between the rollers in front of him. Nor does this take "second sight" or "X-ray eyes." For facing him is a Veeder-Root Counting Device, built-in as an integral part of an electrolimit gage housed in alloy steel of low thermal expansion. This counter is pre-set to the space between the rolls. And when these rolls are in contact with the steel strip, the operator gets a continuous *direct*, micrometric reading which indicates in decimals any variations in the strip passing by.

So it's easy for him to keep everything under constant *Count*rol . . . to keep himself free from the nerve-frazzle of threatening errors, eye-fatigue, and damage to his equipment. In fact, in *all* precision operations, this is the trend in micrometric measurement. . . . direct, decimal readings that are plain and unmistakable. And *you* can count on Veeder-Root to give you the same *Count*rol as here . . . facts-in-figures you can count on to tell you the truth, protect your profits, save you time. Write.

The Counting House of Industry

VEEDER-ROOT INC.

Hartford 2, Connecticut

***In Canada*: Veeder-Root of Canada, Ltd., Montreal**
***In England*: Veeder-Root Ltd. (New address on request)**

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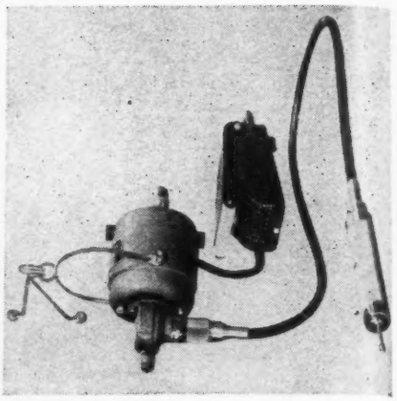
to INCREASE CAPACITY OF STORAGE FACILITIES

Big loads, heavy loads—weighing 6,000 to 18,000 pounds—tiered swiftly, safely to height of 25 feet with ROSS Heavy Duty LIFT TRUCKS. That's just one of the many ways ROSS can reduce your handling costs, increase your plant's efficiency! Let our engineers show you how the ROSS System of heavy duty Lift Trucks and Straddle Carriers will easily tie in with your present handling methods.

Rely on The ROSS System . . built to handle your BIG, BULKY, HEAVY LOADS . . Write for comprehensive ROSS BOOK F-76

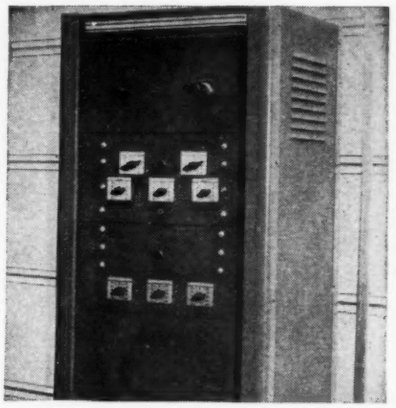
THE ROSS CARRIER COMPANY
300 MILLER STREET, BENTON HARBOR, MICHIGAN, U. S. A.
DIRECT FACTORY BRANCHES AND DISTRIBUTORS THROUGHOUT THE WORLD



speeds of from 3000 to 10.000 r.p.m. Speed is controlled by foot rheostat. The Dumore Co., Racine, Wis.

GRINDING MILL CONTROL

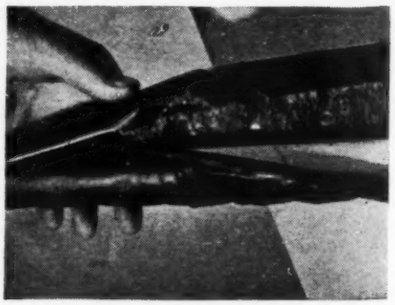
Electronic mill feed control, known as Gai-trol, is claimed to improve the efficiency, output, and performance of tube, ball, bowl, and other types of grinding mills. Consists of a load detector external



to the mill, and connected directly to the electronic component, which is contained in a 66-in., floor-mounted steel cabinet. A circuit from the electronic equipment supplies a variable speed, d.c., feeder drive motor. Speed of the feed motor is controlled continuously throughout a stepless range and without lag, cycling, intermittent action, or over and under hunting, maker states. Gai-tronics Corp., 1417 K St. N.W., Washington, D. C.

PIPE INSULATION

Self-Stik Dri-Pipe insulation prevents condensation under warm, humid conditions by forming a sheath-like jacket around



Wire ahead for Full Production

A FULL CREW, on full pay *ought* to mean full production. But the most conscientious workers can't maintain schedules on power-starved machines.

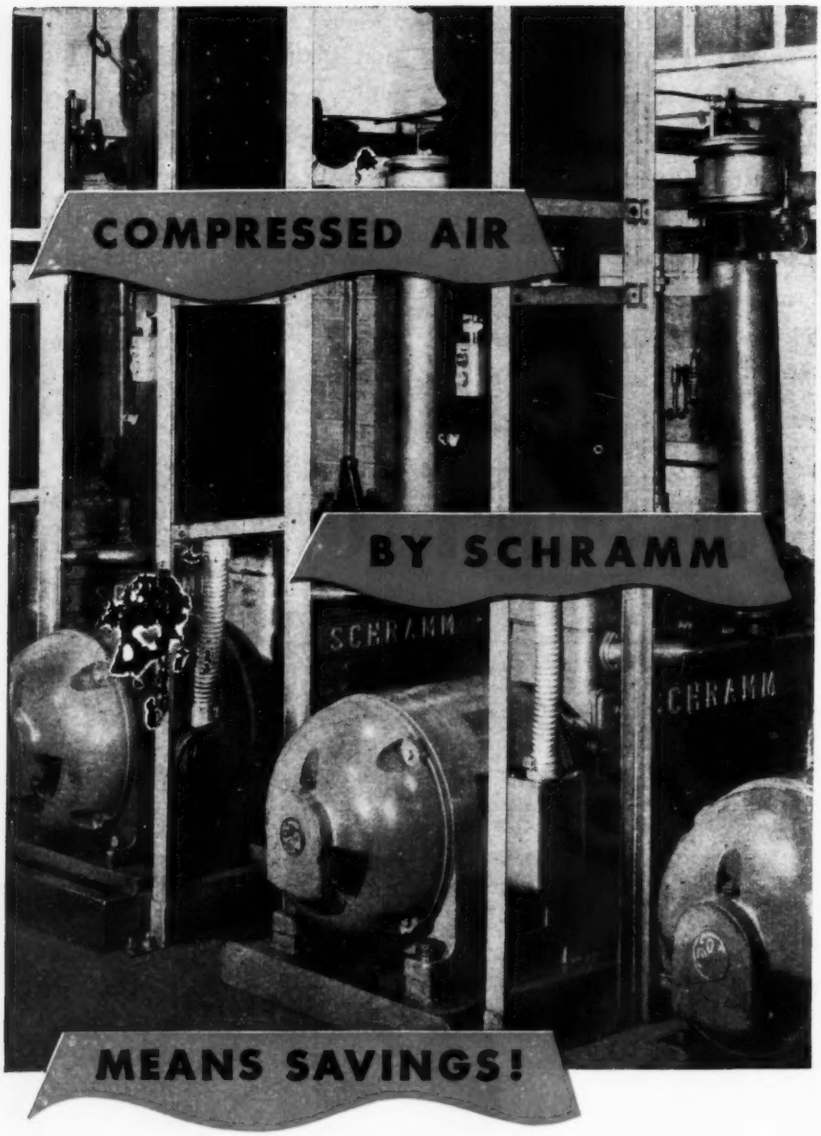
And plant surveys show that obsolete, overtaxed wiring can reduce machine and man power efficiency from 25 to 50 per cent.

By all means make certain your wiring will support your production plans. Check the problem with your plant power engineer, your consulting engineer, electrical contractor or power salesman.

Low-cost electric power, all you want of it, is on the other side of the meter. Make sure it gets where it's needed, to safeguard high-priced man power. 46319

"ABSENTEE WIRING"—INADEQUATE WIRING CAN CUT PRODUCTION 25 to 50 PER CENT

ANACONDA **ANACONDA WIRE & CABLE COMPANY**



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WEST CHESTER
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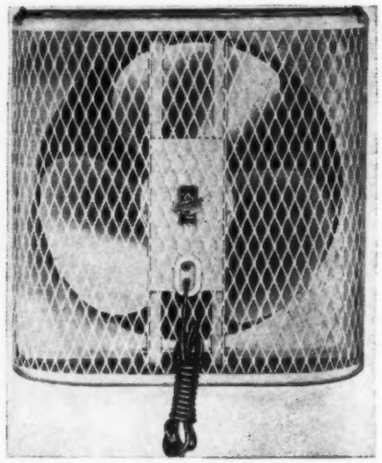
pipes, the maker says. The wrapping, which is fastened lengthwise to the pipes, has self-sealing adhesive edges, for easy application. No tools, except scissors for trimming to size, are needed to install it. Outer backing is a moisture-proof, resinous-coated cloth which prevents dampness from damaging the soft, pliable insulating material. Can also be used for cold air ducts and tanks. Mystik Adhesive Products, Div. of Chicago Show Printing Co., 2635 North Kildare Ave., Chicago 39.

WINDOW FAN

Cooler fan, for window installation in shops and offices, is designed to exhaust 3500 cubic feet of free air per minute. Capacitor motor is said to offer quiet, economical operation. Shielded 20-in.



blades are formed from sheet aluminum. Cabinet dimensions are 24x9x24 inches for mounting in any window with a minimum opening of 20 inches square. Unit can be plugged in any standard baseboard outlet. Emerson Electric Mfg. Co., 1824 Washington Ave., St. Louis 3.

CAPILLARY PEN

Capillary pen for three-pen rectangular industrial recording instruments is of single tube type. The maker states that the end in contact with the chart is swaged to a smaller diameter, and the capillary is less than half the diameter of earlier designs, thus eliminating flooding, and providing minimum pen friction and smooth action even where the instrument has an extremely low actuating force. Brown Instrument Co., div. of Minneapolis-Honeywell Regulator Co., Wayne & Roberts Aves., Philadelphia.

VERTICAL FLOOD VALVE

Having two types of discharge and control heads, cylinder valve Model 4450 adapts the fire-fighting system to special requirements. Remote and local operation of a single cylinder or of several cylinders simultaneously, local operation of a single cylinder without discharging other cylinders in the bank, and local operation of a single cylinder, with on-and-off control, or full discharge of the full contents without on-and-off control are afforded by the valve. Screws into the carbon dioxide cylinder, and

PUT 35 YEARS HANDLING EXPERIENCE TO WORK FOR YOU

A pioneer in the materials handling field, Mercury has over 35 years in the designing, manufacturing and installation of materials handling equipment. This experience is engineered into every Mercury Tractor, Trailer and Lift Truck.

FORK TRUCKS

Available in the following models:

"JEEP" Sit Down, Center Control Fork Truck: 2000 lbs. capacity. Easily maneuvered in limited areas.

"YAK" Center Control Fork Truck: 4000 lbs. capacity. Rugged design.

"YANK" Center Control Fork Truck: 6000 lbs. capacity. Tough continuous service.

ELEVATING PLATFORM TRUCKS

Available in the following models:

"JUNIOR" Models: Low, high and telescopic lift types. 4000 lbs. capacity.

"SENIOR" Models: Low, high and telescopic lift types. 4000 lbs. capacity.

"STANDARD" Models: Low, high and telescopic lift types. 6000 lbs. capacity. Sturdy design.

"MOGUL" Models: Low and high lift types. 10,000 lbs. capacity. Designed for unusually heavy loads.

TRACTORS—TRAILERS

Available in the following models:

"TUG" Electric Tractor: Powerful compact tractor available in twin-wheel and 4-wheel models, medium or heavy duty.

"BANTY" Gas Tractor: Most compact tractor made, yet develops a draw bar pull in excess of 2000 lbs.

"HUSKIE" Gas Tractor: A powerful, 6-cylinder, 4-wheel tractor. Built to haul any wheeled load it might encounter in industry.

"SUPER-HUSKIE" Gas Tractor: Dual, rear-wheeled industrial tractor powered with 6-cylinder engine. Built for severe industrial service.

TRAILERS: Available in castor or 5th wheel steer, platform or side dump types.

THE TRACKLESS TRAM

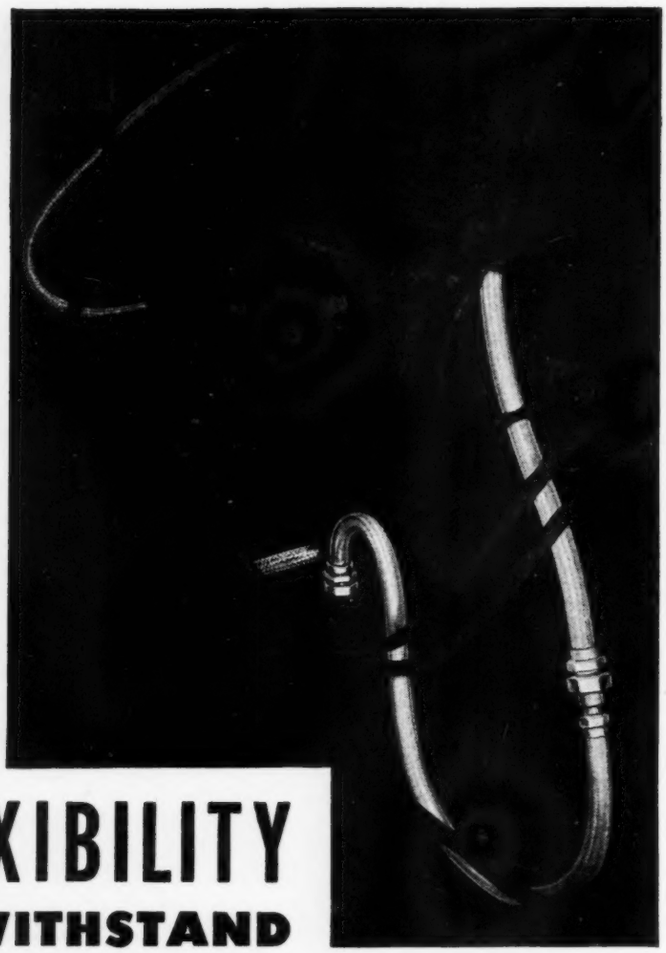
MERCURY

THE MERCURY MANUFACTURING CO.
4110 S. Halsted St., Chicago 9, Ill.

TRACTORS—TRAILERS—LIFT TRUCKS

FREE: Mercury "Pocket-Catalogue"

For complete data on all Mercury equipment, including the latest additions to Mercury's expanded materials handling line, request Bulletin 201-6.



FLEXIBILITY
TO WITHSTAND
120 STROKES PER MINUTE

Despite constant flexing and twisting this Titeflex all-metal Flexible Tubing has been faithfully conveying coolant to the wheel on this huge grinding machine for many years. The inherent pressure-tightness and long service-life of Titeflex prevent line leakage which would impair operating efficiency—interrupt important production schedules.

Similarly, Titeflex provides identical trouble-free protection and service while operating under critical heat, cold, pressure, and corrosive attack.

The same economies and increased service performance can benefit your product and plant production. We will be glad to give you the facts on all types of Titeflex installations. Catalogue No. 113 is available on request. Titeflex, Inc., 505 Frelinghuysen Ave., Newark, New Jersey.

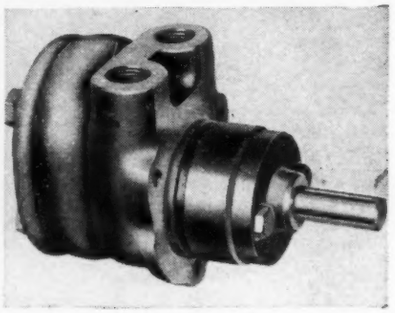
Titeflex

THE ALL-METAL FLEXIBLE TUBING THAT STAYS TIGHT

consists of a main discharge section and a control port section, both of which are normally sealed by pressure of the gas in the cylinder. Both discharge heads contain a piston which, when depressed, opens the main discharge port of cylinder valve. Walter Kidde & Co., 675 Main St., Belleville, N. J.

ROTARY PUMPS

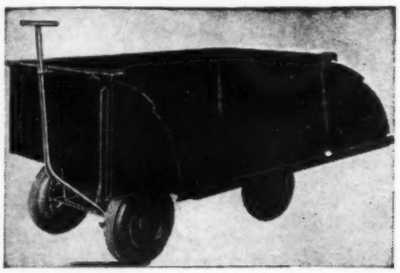
Series K rotary pumps, in ¾, 1½, and 3 g.p.m. sizes, can be hub, flange, or foot mounted for belt, chain, or direct drive. With separate mounting brackets provided



to requirements, they are suitable to use as a replacement. Complete units are also available with bed plate and motor, or fitted to receive motor. Having only two moving parts, they operate in either direction, and are self-priming. Geo. D. Roper Corp., Rockford, Ill.

DROP SIDE CART

Load cart has drop side which may be locked in closed, half-open, or fully opened position. Hinges are designed to eliminate crevice between drop side and bottom of



truck when it is fully open. Capacity is approximately 1000 pounds, volume, 22½ cubic feet. Inside dimensions are 60x36x18 inches, and over-all height is 36 inches. Comes with pneumatic, semi-steel, or cushion rubber wheels, 16 inches in diameter. Materials Handling Div., Market Forge Co., Garvey St., Everett, Mass.

FAN

Fly Chaser fan can be placed in front of doors to force air downwards, providing a continuous stream of air through which, maker claims, flies and mosquitoes can not pass. It is said not to annoy persons entering or leaving, and to help prevent entry of dust and heat. Has Deflek-Aire unit to spread the air in front of a door 3 feet wide. Also furnished for protecting food counters, conveyors, processing machines, vats, and wrapping tables. Adjustable to blow downward at various angles. Propellers are 20 inches in diameter and three speeds. Fan operates on 110-volt, 60-cycle,

Nicholson sells only through Mill-Supply and Hardware Distributors

Here's how this system benefits you as an industrial user

The distributor of industrial tools and supplies performs a very necessary function in the commercial economy of a nation whose industries are huge, varied and located over a vast area.

He is both a *gatherer* and a *distributor*.

He scours the earth for the things you need. He examines and studies them; weighs their merit and value; helps determine which brands will serve you best. Thus he becomes expert on selection, application and proper use. He stocks or warehouses countless items—and patiently awaits your pleasure as to *when* you may want *how much* of *what*.

He takes over sales, credit, delivery and other services which, if handled by the manufacturer himself, would increase the latter's supplying costs—and consequently your purchasing costs.

Yes, your industrial distributor does these and many more things in both your and the manufacturer's behalf which it would be uneconomical for either to do independently.

The more support he gets—from both manufacturer and user—the more useful he becomes to all concerned. Nicholson believes firmly in this policy.

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SEE ESPECIALLY PAGES 11 to 15

for detailed description of characteristics of all types of Milford Rivets; where, how and why they save time and money. Indispensable information for designers, engineers, purchasing agents and all executives concerned with production and especially with fastening problems.

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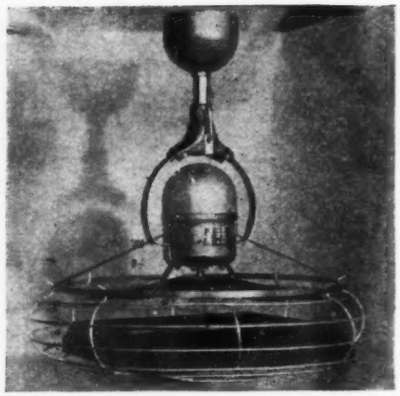
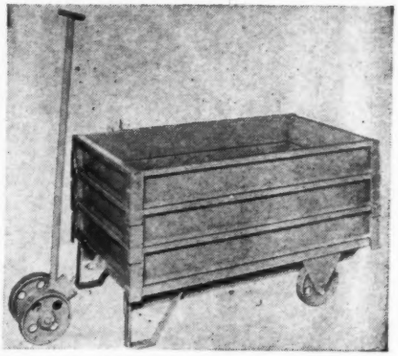


a.c., but can be supplied with d.c. or other current characteristics. Reynolds Electric Co., 2650 West Congress St., Chicago 12.

SEMI-SKIDS AND JACKS

All-welded steel semi-skid is designed to be used with skid jack, or with hand or power lift truck. Clear space under deck and between side members permits entrance of lifting devices from either end. Rear



wheels are mounted in steel supports which straddle the wheel. Nesting type box sections that fit over the skid deck to retain loads are available. Skid jack is equipped with two wheels, 8 inches in diameter, mounted on roller bearings with a hardened axle. Hook arrangement permits more than 1 inch of lift for the front legs. Units can be supplied with wheels of semi-steel, plastic, cushion rubber, or aluminum. Market Forge Co., Everett, Mass.

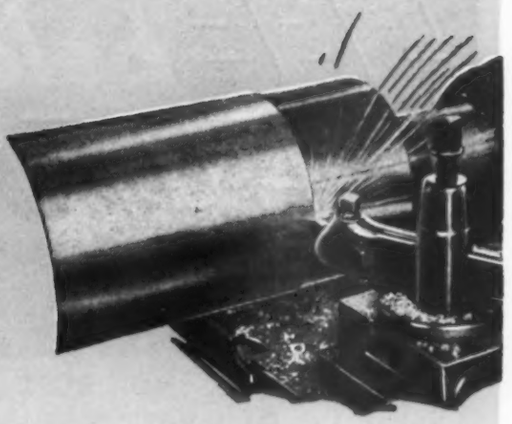
WASTE LINE CLEANING TOOL

Tool called 5-Way, for cleaning out sewer and waste lines, can be operated by one man. No other tools or wrenches are needed. Flexible cable with corkscrew tip works down the line through screen or crossbar, around bends, down "T" joints, through the stoppage. Revolving knob actuates the cable, which is kept in steel container. O'Brien Mfg. Co., 5016 North Austin Ave., Chicago 30.

LIQUID LEVEL CONTROL

Series 10 consists of maintenance-free relays for the level control of electrically conductive liquids. Contact with the liquid is made only by a stainless steel probe rod. There are no floats, bellows seals, or stuffing boxes. Alternating cur-

make these machining economies



. . . daily savings in plants like yours!

Machining economies unmatched by other common structural metals . . . savings in time, tools, and power . . . are everyday practice in the modern shops now using magnesium.

With magnesium you can machine at highest speeds—often the top speeds of modern machine tools. Magnesium permits heavier depths of cut and higher rates of feed than other structural metals; provides good surface finish.

Cutting tools, especially carbide tipped tools, stand up for exceptionally long periods in machining magnesium.

You save considerably, too, in the power needed to remove a given quantity of magnesium by machining. The horsepower per cubic inch per minute normally ranges between 0.15 and 0.3.

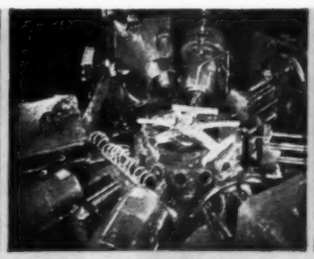
The nearest Dow office can give you all the details on these and many other magnesium advantages.

Ready . . . to make products move!

MAGNESIUM

LIGHTEST OF ALL STRUCTURAL METALS

Rotary files, operating between 4500 and 7000 r.p.m., are widely used to clean up irregular surfaces on magnesium castings.



Machining mass production parts such as this blower section for a radial aircraft engine is materially speeded with magnesium.

While finish grinding is usually unnecessary, rough grinding is generally used in magnesium foundry clean-up, as shown above.

MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY, DETROIT, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

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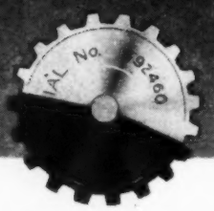
Add Sales Appeal to Rust Prevention . . .
with the NEW
TRANSPARENT
NOX RUST
CLEARCOAT #626

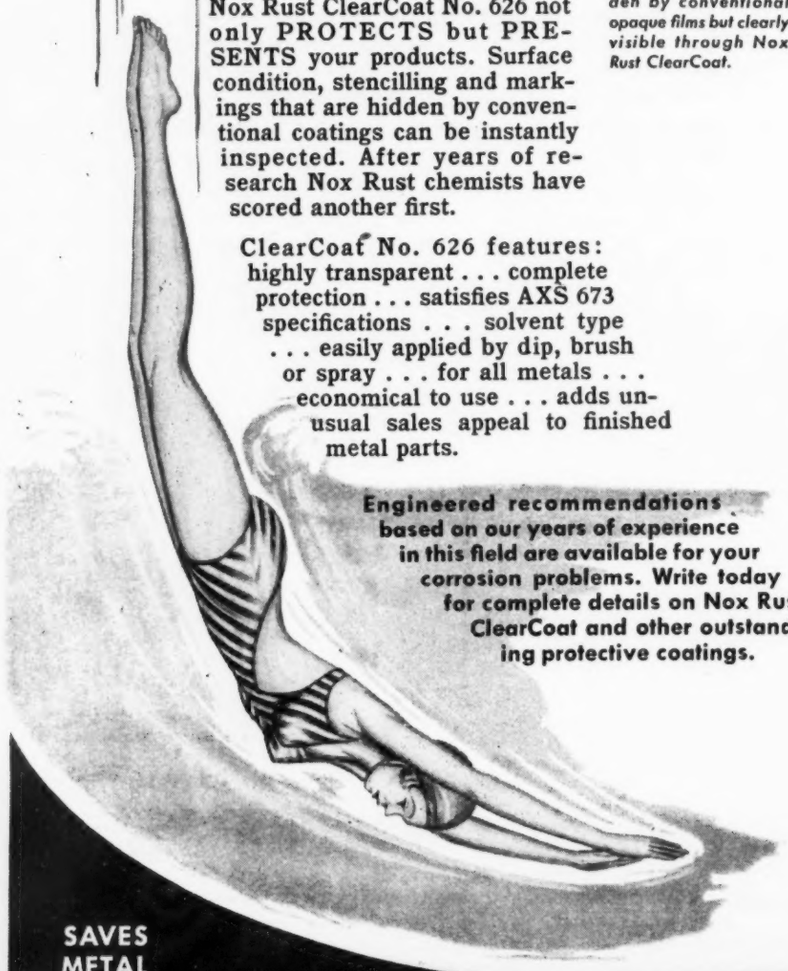


The first transparent rust preventive to meet rigid government AXS 673 specifications, Nox Rust ClearCoat No. 626 not only PROTECTS but PRESENTS your products. Surface condition, stencilling and markings that are hidden by conventional coatings can be instantly inspected. After years of research Nox Rust chemists have scored another first.

Product surface, condition and markings hidden by conventional opaque films but clearly visible through Nox Rust ClearCoat.

ClearCoat No. 626 features: highly transparent . . . complete protection . . . satisfies AXS 673 specifications . . . solvent type . . . easily applied by dip, brush or spray . . . for all metals . . . economical to use . . . adds unusual sales appeal to finished metal parts.

Engineered recommendations based on our years of experience in this field are available for your corrosion problems. Write today for complete details on Nox Rust ClearCoat and other outstanding protective coatings.



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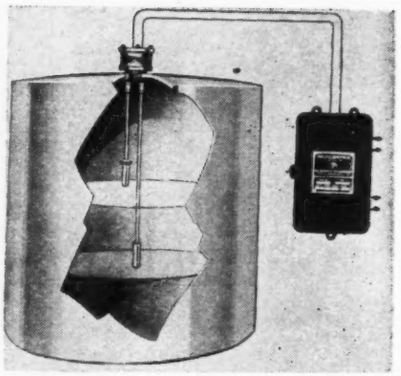
Chemicals for American Industry

NOX-RUST
CHEMICAL CORPORATION

SAVES MONEY

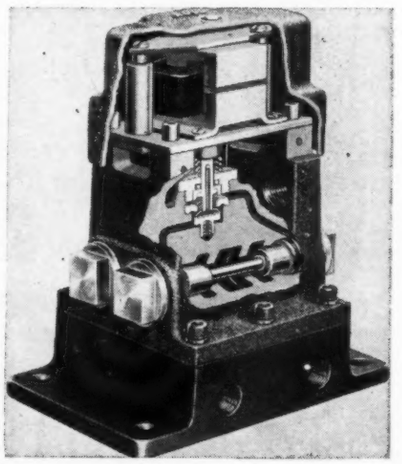
2459 So. Halstead St. **Chicago 8, Ill.**



rent in probe circuit prevents electrolytic action, and mica-insulated probes eliminate leakage. Control contains no vacuum tubes, and operates with low voltage in probe circuit. Selection from four terminals on terminal block enables control to be matched to specific resistivity of a material. Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.

AIR VALVE

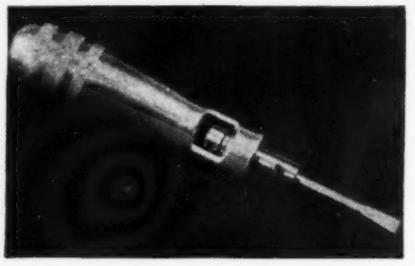
Piston poppet, pilot operated, solenoid controlled air valve is designed to allow operating speeds up to 400 cycles per minute, with current consumption 1.2 amperes on 110-volt, 60-cycle a.c. All working parts are



interchangeable; removing the two end plugs permits replacement of piston poppet assembly. Available in 3-way (normally open or normally closed), 4-way, and 4-way (5 port) types; and in $\frac{1}{4}$-, $\frac{3}{8}$-, $\frac{1}{2}$-, and $\frac{3}{4}$-in. sizes. Ross Operating Valve Co., 6477 Epworth Blvd., Detroit 10.

TORQUE SCREWDRIVERS

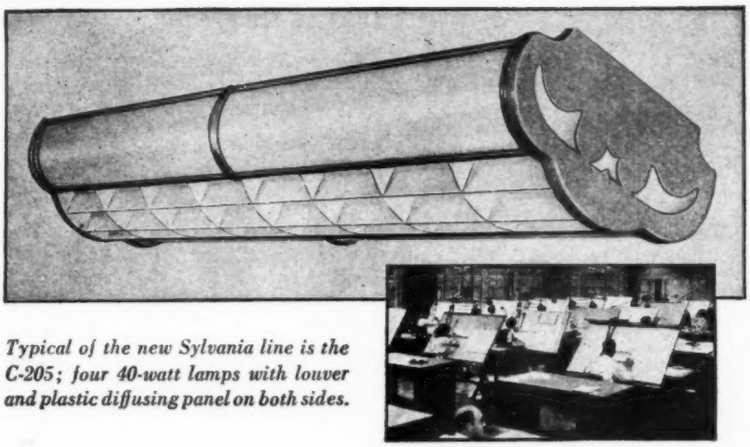
Torque measuring and controlling screwdrivers are designed for continuous precision service on production and assembly lines, and for maintenance work. Opera-



SYLVANIA NEWS

INDUSTRIAL EDITION

JULY *Prepared by* SYLVANIA ELECTRIC PRODUCTS INC., Salem, Mass. 1946

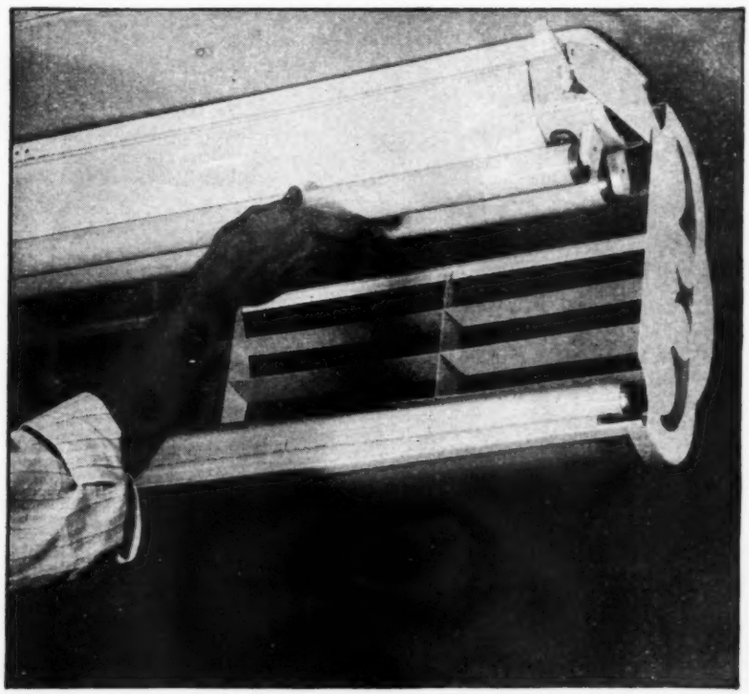


Typical of the new Sylvania line is the C-205; four 40-watt lamps with louver and plastic diffusing panel on both sides.

A TREND TO FLUORESCENT LIGHTING in plant office areas is seen as the logical result of industry's experience with its beneficial results in the manufacturing departments.

Sylvania Electric's new commercial-type fixtures anticipate this trend. They incorporate the same advanced engineering that made Sylvania's *industrial* fixtures an outstanding success. In addition, they are carefully designed to harmonize with office surroundings.

Industry's Offices, Drafting Rooms Get Needed Fluorescent Lighting; Maintenance No Problem



To meet industry's demand for excellent lighting in offices, drafting rooms and the like, Sylvania has designed eleven basic fluorescent fixtures for both single or continuous row mounting.

These fixtures, besides combining the foremost developments in modern lighting techniques, the best in quality and styling, are extraordinarily simple to maintain.

It is not necessary to remove a single nut or screw in any Sylvania industrial or commercial fixture to change lamps or starters. The plastic panel and louver on the model shown above, for instance, are secured by gravity latches and hinges. When latches are released, the assembly swings down (see photo, left) and forms a basket for lamps during replacement or lifts completely off for cleaning.

Write Sylvania Electric Products Inc., Salem, Massachusetts.

SYLVANIA ELECTRIC

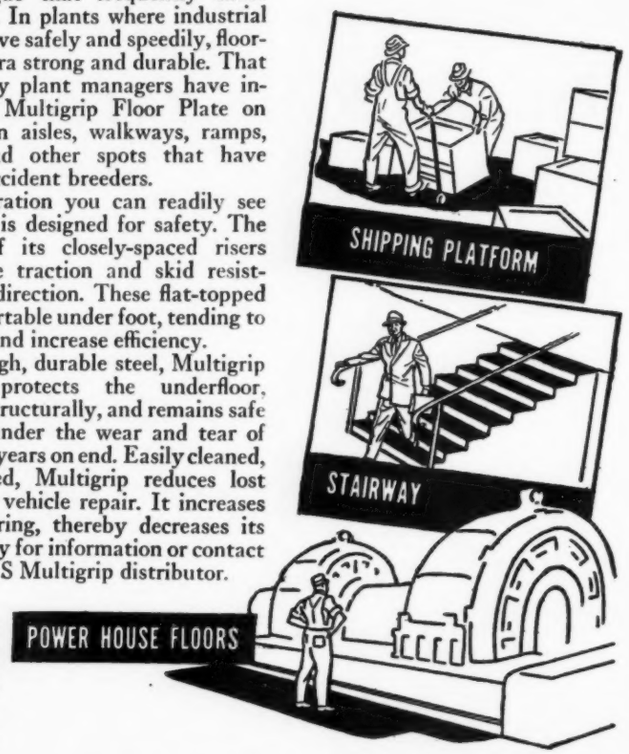
MAKERS OF FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS; RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES

Guard Danger Zones in your Plant!

WHEREVER there is work to be done, men need protection from stumbles, falls and fatigue that frequently cause serious injuries. In plants where industrial trucks must move safely and speedily, flooring must be extra strong and durable. That is why so many plant managers have installed U·S·S Multigrip Floor Plate on entire floors, on aisles, walkways, ramps, step plates and other spots that have proved to be accident breeders.

In the illustration you can readily see that Multigrip is designed for safety. The arrangement of its closely-spaced risers assures positive traction and skid resistance, in every direction. These flat-topped risers are comfortable under foot, tending to reduce fatigue and increase efficiency.

Rolled of tough, durable steel, Multigrip Floor Plate protects the underfloor, strengthens it structurally, and remains safe —wet or dry—under the wear and tear of plant traffic for years on end. Easily cleaned, quickly installed, Multigrip reduces lost man-hours and vehicle repair. It increases the life of flooring, thereby decreases its cost. Write today for information or contact your local U·S·S Multigrip distributor.



LISTEN TO . . . the "Hour of Mystery" presented by United States Steel on the radio every Sunday evening. Consult your local newspaper for time and station.

CARNEGIE-ILLINOIS STEEL CORPORATION · USS MULTIGRIP FLOOR PLATE · UNITED STATES STEEL

U·S·S MULTIGRIP FLOOR PLATE

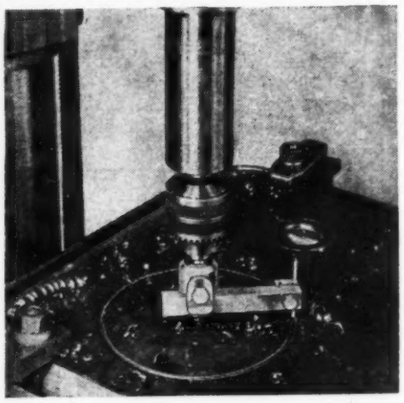
CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh and Chicago
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

tion is simple—the screwdriver is pre-set at the desired torque; the operator tightens the screw, nut, or bolt; when the pre-set torque is reached the screwdriver handle slips and no further tightening of the screw is possible, maker says. Units come with one regular blade for slotted screws, nuts, or bolts, one Phillips-type blade, one Allen wrench and pin setter. Three sizes are available, 0-6, 0-12, and 0-25 inch-pounds torque. Airdraulics Engineering, Inc., New Canaan, Conn.

CIRCLE CUTTERS

Adjustable circle cutter cuts holes to any diameter from 1¾ to 8 inches through ¼-in. steel or other tough metals, and any

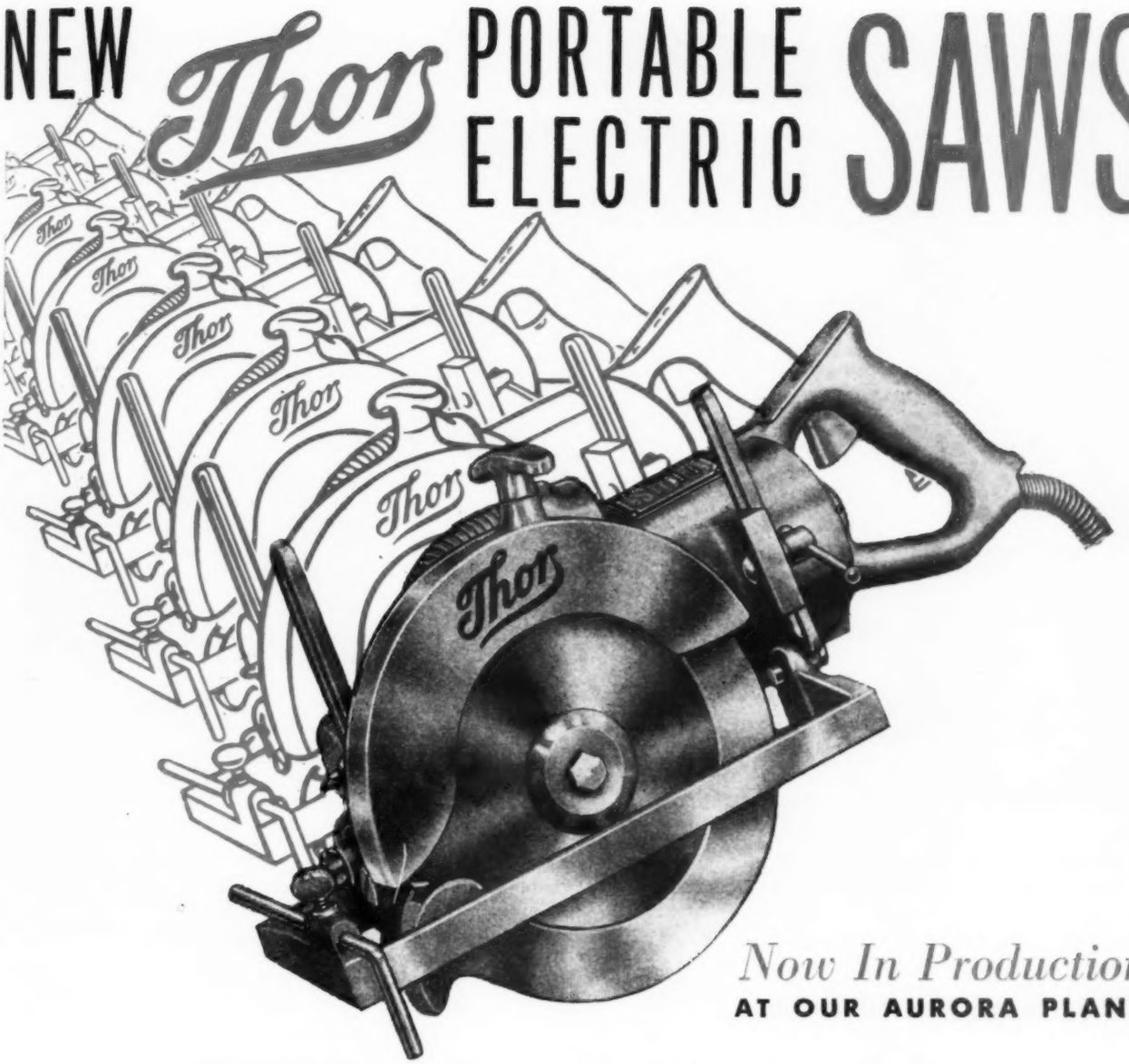


thickness up to 1½ inches in plastics, fiber, or wood. Tool is designed to operate in any standard drill press, woodworking machine, or suitably mounted spindle machine. Consists of a combination drill and pilot with high-speed cutting blade, adjustable to depth and diameter. Cutting blade is resharpened without special tools by grinding on one edge only. Also available is twin-blade holder (fixed ½-in. center) which cuts washers, wheels, disks, and gaskets in one operation. Bruno Tools, 9330 Santa Monica Blvd., Beverly Hills, Calif.

HYDRAULIC FLOOR CRANE

Floor crane has a movable lifting beam powered by a hand operated hydraulic system. Action can be up, down, in, or out. Appli-

NEW Thor PORTABLE ELECTRIC SAWS



Now In Production
AT OUR AURORA PLANT

Here they come—*packed full of new tool features*—the new Thor Portable Electric Saws!

Now in production in volume for delivery through Thor distributors everywhere, these new Thor Saws are available in 6″, 7″ and 8″ blade sizes for all types of cutting in wood or metal.

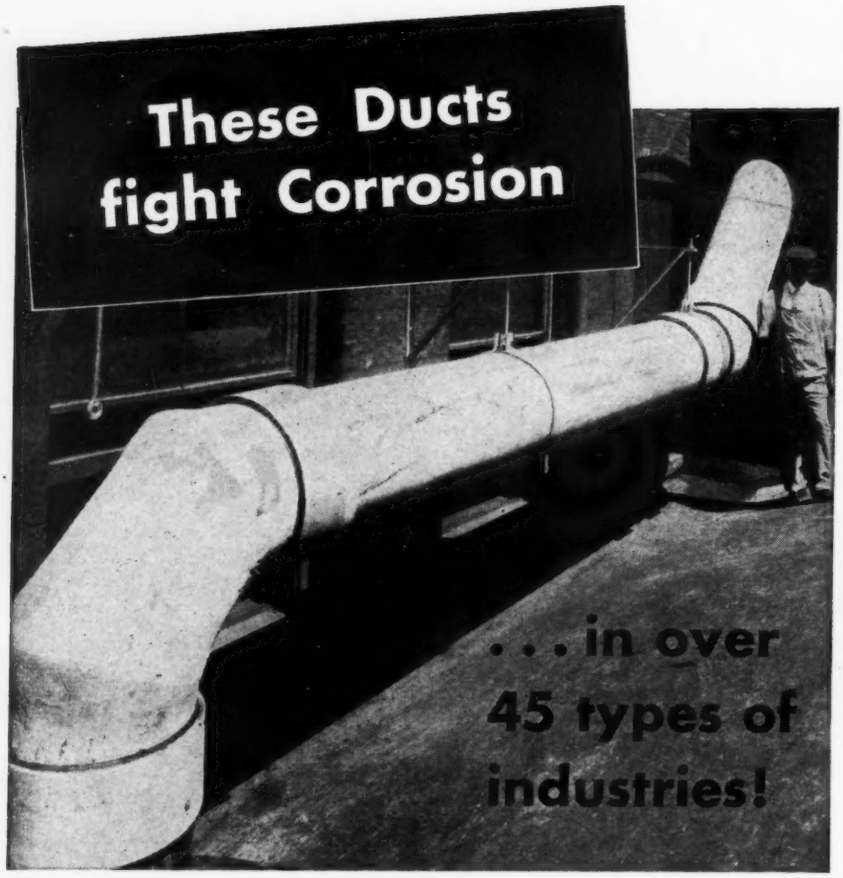
See these new Thor Saw features for yourself *now*—call your nearby Thor distributor for a demonstration.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Boulevard, Chicago 6, Illinois

Birmingham Boston Buffalo Cleveland Detroit Los Angeles Milwaukee New York Philadelphia
Pittsburgh St. Louis Salt Lake City San Francisco Toronto, Canada London, England

Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS



FOR many years, ducts, vents and stacks of Transite Industrial Vent Pipe have helped solve corrosion problems in more than 45 types of industries.

This strong, durable pipe successfully resists many of the corrosive fumes, vapors, dusts and gases encountered in industrial operations . . . providing effective and economical venting service.

Transite Industrial Vent Pipe is rustproof . . . highly weather-resistant . . . needs no paint. Made of asbestos and cement, it is light in weight . . . easy and economical to install. Available in sizes up to 36" in diameter, with a complete line of Transite fittings to assure corrosion-resistance throughout the system.

For details, write for Data Sheet DS-336. Address Johns-Manville, Box 290, New York 16, N. Y.

JM PRODUCTS

Typical industries in which Transite Industrial Vent Pipe is used

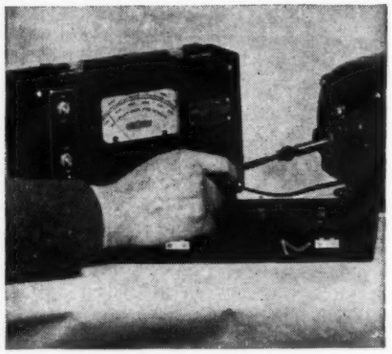
Aircraft	Dairy	Gas	Petroleum	Shipbuilding
Automobile	Drug	Glass	Potash	Shoe
Baking	Electrical	Laboratory	Pulp & Paper	Smelting
Bleaching	Explosive	Laundry	Quarrying	Soap
Boiler Works	Farm Machinery	Leather	Railroad	Soft Drink
Brewing	Food	Meat Packing	Rayon	Sugar Refining
Canning	Foundry	Metal	Refrigeration	Textile
Ceramic	Furnace	Mining	Rubber	Tool
Chemical	Furniture	Paint	Sewage Works	Water Works

Johns-Manville
TRANSITE Industrial Vent **PIPE**

cations include removing cab over engines, stacking heavy crates, moving large machines and parts, and removing transmissions. Unit can be wheeled into any position and the load can be moved and spotted. Made in three sizes, 3- and 2-ton models, each in two mast heights with adjustable traveling boot; and 1-ton model for smaller shops. Ruger Equipment Co., P. O. Box 3821, Portland 8, Ore.

PORTABLE TACHOMETER

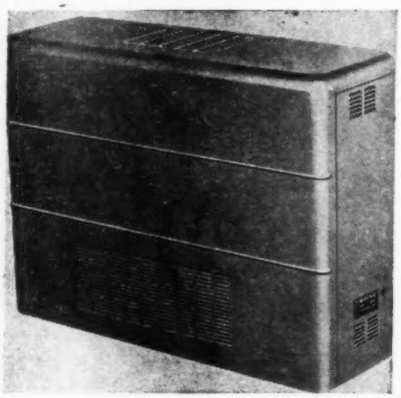
Tachometer is designed to measure speeds at approximately the two synchronous speeds of 1800 and 3500 r.p.m. It is available in three models, each with two sets of ranges, covering, in all, speeds from 1500 to 4400 r.p.m. The tachometer has no



flyballs, gears, or generator to service. Scales are linear and easy to read, with claimed accuracy of ¼ to 1 percent. Operates from 115-volt a.c. power line without vacuum tubes, and is stabilized against line voltage variations. Only two controls—on-off switch and high-low range switch. Metron Instrument Co., Denver.

AIR CONDITIONING

The Custom-Air System of air conditioning for the multi-room, multi-story building consists of an individual unit in each room space and a separate central system. Room units recirculate and filter air to offset heat losses or gains in the space they are located. The central system supplies outside air, humidified or dehumidified, through either a high or low pressure system of ductwork, and operates independently of the room units, which are self-powered. Control is automatic, and it is possible to heat in one room and cool in another in the same zone because air temperature from central system is kept below room temperature. Amount of heat



You Can Clean These Filters

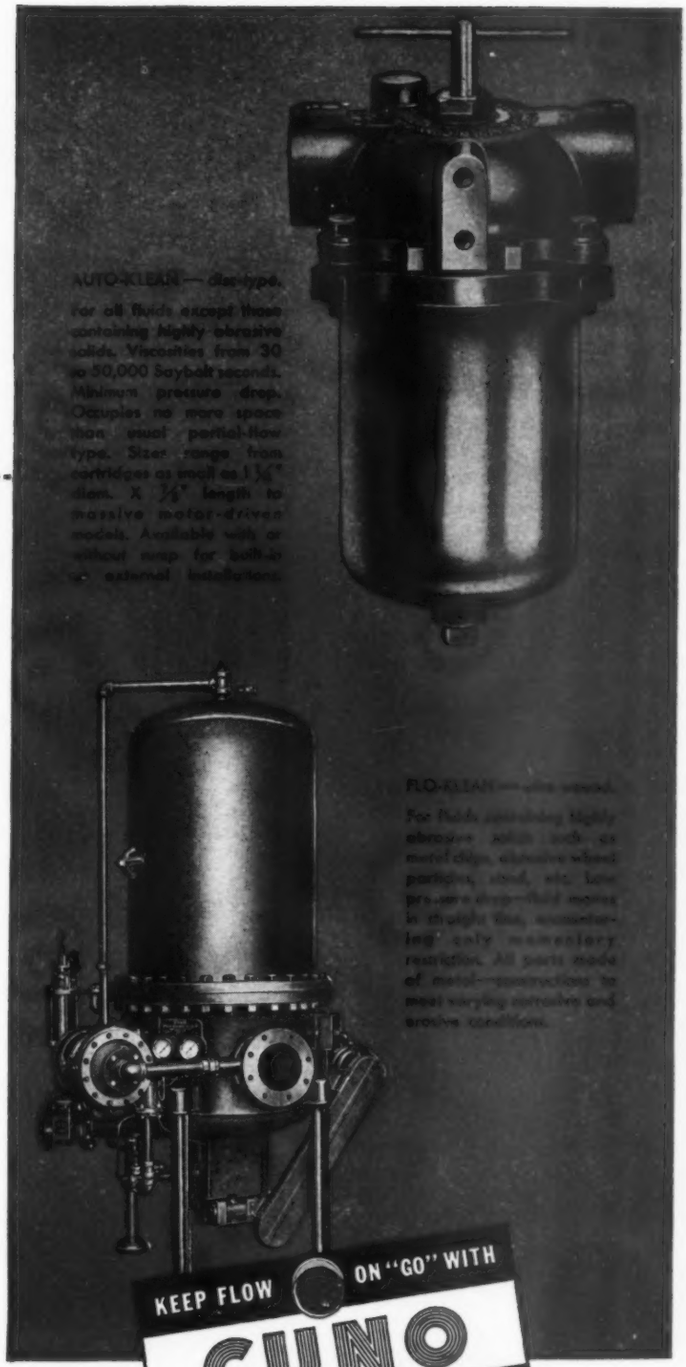
WITHOUT TURNING A VALVE

Flow never has to be stopped or diverted while a Cuno Filter is being cleaned. And you get this advantage without the expense — in space and investment — of a duplex installation.

Accumulated solids are removed . . . by turning a handle (with hand or motor) in the case of the Cuno Auto-Klean . . . by a motor-driven backwash system in the case of the Cuno Flo-Klean.

There is nothing, in either model, to remove or renew. The filter element is all-metal, non-collapsible. The only attention required is periodic emptying of the sump.

For positive cleaning action that is effective, as specified, down to .0025" particle size, specify Cuno. See Cuno catalog in SWEET'S for selection factors and specifications; or send coupon for complete Cuno catalog. Staff engineers are available for special recommendations.



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6110 South Vine Street, Meriden, Conn.

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☐Enamel
☐Engine Fuel
☐Engine Lubricating Oil
☐Fuel Oil
☐Fuel Tar
☐Gases
☐Gasoline
☐Grease
☐Grinder Coolant
☐Hydraulic Oil
☐Japan
☐Lacquer
☐Lubricating Oil
☐Machine Tool Cutting Oil
☐Machine Tool Hydraulic Oil
☐Machine Tool Lubricating Oil
☐Nitrocellulose Solutions
☐Oils
☐Paint
☐Pyroxylin
☐Quenching Oil
☐Resins
☐Rust Proofing Compounds
☐Sizing
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☐Varnish
☐Washing Compounds
☐Water
☐Wax

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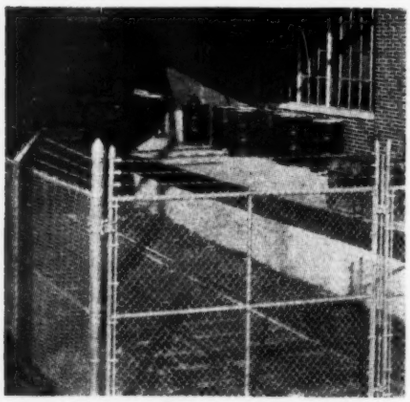
Safety and Protection
MORE IMPORTANT THAN EVER

THE ONLY CHAIN LINK FENCE MADE OF * KONIK STEEL

KONIK is the registered tradename for the patented steel containing copper, nickel and chromium used in Continental Chain Link fence fabric. KONIK possesses a greater tensile strength and higher elastic limit and is rust-resistant "clear through." All the extra value of this modern steel now comes to you only in Continental Chain Link fence.

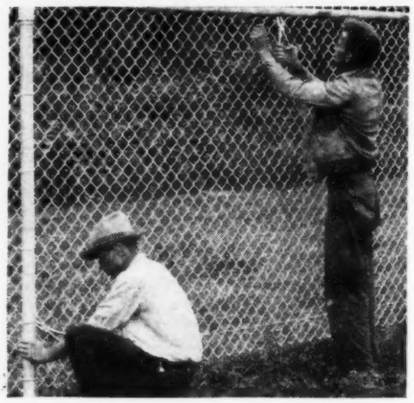


ENGINEERED FOR PROTECTION

Continental fence has 14 distinctive construction features including heavier line posts . . . stronger and more easily operated gates . . . improved pivot-type hinges . . . self-locking barb arms . . . and 20% more ties . . . fabric of rust-resistant, full gage wire of KONIK steel with heavy uniform zinc coating. Continental fence combines style with durability and positive protection for your property.

TAILORED TO FIT YOUR PROPERTY

Experienced fence engineers plan and help erect Continental Chain Link fence anywhere. No matter what your property protection problem, Continental fence is designed for your installation, then custom-built for quick erection on the site. Correct and economical construction can be done by trained erection crews. When local labor is to be used, Continental can supply a competent foreman and inspection service. *Write for FREE fence manual.*



*TRADE MARK REG. U. S. PAT. OFFICE

CONTINENTAL SUPERIOR STEEL

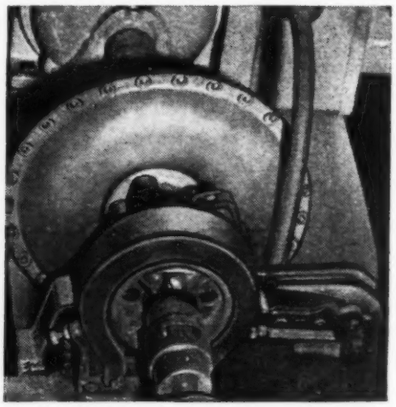
CONTINENTAL STEEL CORPORATION
GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF Manufacturer's Wire in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Copperized, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

provided by room units can be cut down or increased as desired. The Trane Co., La Crosse, Wis.

FLUID COUPLING

Hydraulic oil coupling is said to eliminate the necessity for both a transmission and a differential mechanism. The self-contained unit can be installed directly on the



shaft of any engine or electric motor. Completely enclosed, preventing entrance of dust and dirt. Toolcraft Mfg. Co., Huntington Park, Calif.

ELECTRIC RADIATOR

The Co-z-air line of portable electric radiators, using no water or other liquids, gives off both radiated and convected heat. The ratio of convected to radiated heat is proportioned to the rate of evaporation of moisture from the human body, to provide maximum body comfort. The units are available in 5- and 8-section models, at 115 volts, plug-in type, and a 12-section model, at 220 volts, wired-in type. Henry J. Morton Associates, Inc., 510 Boulevard Bldg., Detroit 2.

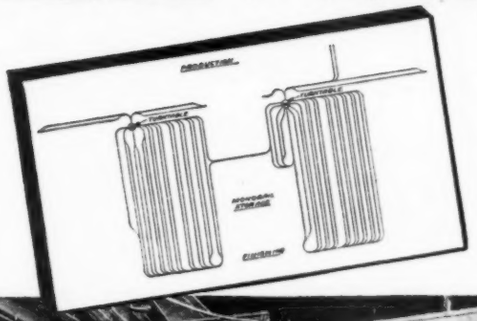
INSULATED WINDOWS

Twindows are integral insulating units of two or more plates of glass enclosing a quarter-inch or half-inch hermetically sealed air space. Hollow aluminum tubing is used to separate and hold the glass plates in position. Entire unit is framed with a light-gage stainless steel channel (0.015 to 0.020), with the channel legs extending ⅜ inch inward on surface of glass from base around its periphery to provide maximum protection during installation and use. Window is claimed to prevent condensation, permitting use of larger units, with reduction in heating and air conditioning costs. Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh.

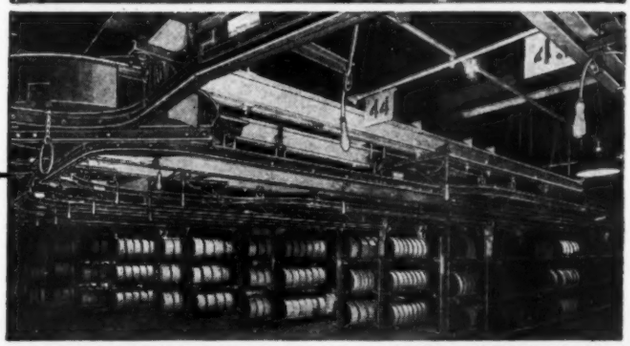
MOTOR STARTING RELAY

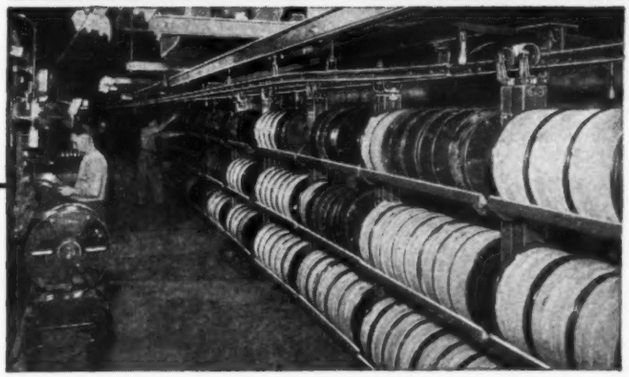
Centrifugal throwout mechanisms are eliminated by motor-starting relay, known as MS2A. It is voltage-actuated, and operates on the back e.m.f. of the starting winding. When motor has attained speed the relay immediately disconnects the starting coil from the line. No overload, with its attendant heavy current flow, can prevent it from positive operation once proper motor speed has been reached, maker says. The starting relay operates

FLEXIBILITY



of AMERICAN MONORAIL EQUIPMENT Solves Difficult Handling Problems





Here is another of the hundreds upon hundreds of handling problems efficiently and economically solved by American MonoRail Overhead Handling Equipment.

THE PROBLEM: To eliminate manual handling of reels from production machines to storage, from storage to finishing, from finishing to storage or shipping as required.

THE ANSWER: The FLEXIBILITY of American MonoRail switching arrangements permits reels to move on carriers with no rehandling between processes. Ample live storage is allowed, permitting free movement between all processes.

What is your handling problem? American MonoRail Engineers come up with the answer to efficient and economical handling ninety-nine times out of a hundred. We invite your inquiries.

SEND FOR BULLETIN C-1. A 56 page book showing successful applications of American MonoRail Systems

THE AMERICAN MONORAIL COMPANY

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Maintenance and repair jobs are speeded up SAFELY—with the OTC PULLING SYSTEM. It removes and replaces gears, bearings, sheaves, pulleys, shafts, wheels and other close-fitting parts—easily, quickly, without damage to critical parts, without back-straining labor. Reduces injury risks. Approved by Timken, SKF, Hyatt, M-B-C and New Departure for use on their bearings.
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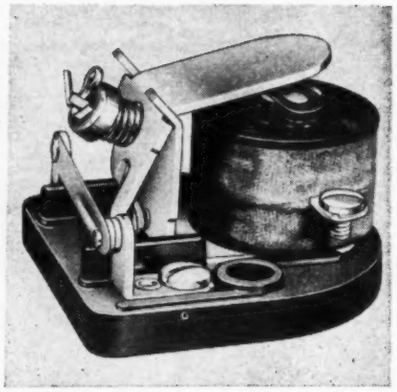


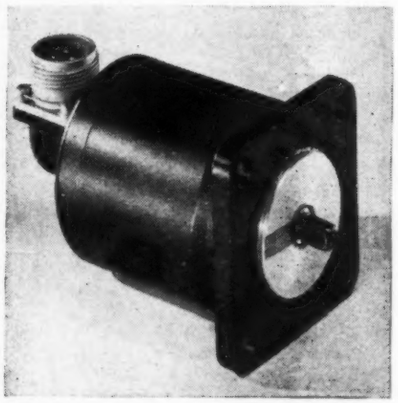
over a range of line voltage variations, and can be used on normally low voltage lines with heavier current flow. May be mounted on motor housing or located at any distance, permitting operation of the motor in a combustible atmosphere. Potter & Brumfield Sales Co., Dept. 215, 549 West Washington Blvd., Chicago 6.

PLASTIC HAMMER

Kant-Mar hammer has a double head of hard plastic that will not mar or dent flat metal surfaces, according to the manufacturer. Heads, mounted on hickory handle, are interchangeable. Base of the nonbreakable, fireproof, and acid-proof head is made of machined aluminum, to give over-all light weight. Made in three sizes. Schmidgall Manufacturing Co., 307 Cass St., Peoria 2, Ill.

TACHOMETER GENERATOR

Electric tachometer generator, known as Compak, weighs less than 23 ounces. Units are directly interchangeable with



other standard a.c. 3-phase generators used with electric tachometer indicators of the magnetic drag type. Operates in either direction. Kollsman Instrument Div., Square D Co., 80-08 45th Ave., Elmhurst, N. Y.

PRESSURE LUBRICATOR

Loader pump, for hand lubricating guns, and high pressure volume bucket pump have been combined to form a single, portable unit. Hydraulic hose plug prevents lubricant from escaping through grease hose when loading a hand gun. Hand gun automatically disconnects from loader

DESIGNED AND ENGINEERED AT NO. 1 PLASTICS AVENUE
PROBLEM—
MOLD LOUD-SPEAKER DIAPHRAGMS. MUST BE STRONG ENOUGH TO WITHSTAND GUN BLAST... FLEXIBLE ENOUGH FOR EXCELLENT VOICE REPRODUCTION

PLASTICS VOCAL CORDS FOR OUR FLEET

When her big guns spoke, a warship's loud-speaker system didn't. Gun blast was too much for the loud-speaker diaphragms. They failed when needed most for battle commands.

This naval problem was brought to No. 1 Plastics Avenue and was solved by General Electric's *complete* plastics service. General Electric engineers developed a special phenolic-treated cloth that can be molded as thin as 0.003 in., and drawn to domed contours of acoustical precision.

These plastics diaphragms can take it. They kept on speaking through many a sea battle. And these new tough, but sensitive, diaphragms can keep many a peacetime loud-speaker on the job, too.

Cloth-based plastics can be precision-molded in many forms to combine thinness, strength, and flexibility. If you need such a component, or any other plastics part, see G. E.—the world's largest manufacturer of finished plastics parts. Plastics Divisions, Chemical Department, General Electric Co., 1 Plastics Avenue, Pittsfield, Mass. *Send for a copy of the new illustrated booklet, "What Are Plastics?"*

EVERYTHING IN *Plastics*

G-E Complete Service—Everything in Plastics

Backed by 52 years of experience. We've been designing and manufacturing plastics products ever since 1894. G-E Research works continually to develop new materials, new processes, new applications.

No. 1 Plastics Avenue—complete plastics service—engineering, design and mold-making. Our own industrial designers and engineers, working together, create plastics parts that are both scientifically sound and good-looking. Our own toolrooms are manned by skilled craftsmen—average precision mold experience, 12 years.

All types of plastics. Facilities for compression, injection, transfer and cold molding . . . for both high and low pressure laminating . . . for fabricating. And G-E Quality Control—a byword in industry—means as many as 160 inspections and analyses for a single plastic part.

GENERAL ELECTRIC

CD46-A13

General Electric plastics factories are located in Fort Wayne, Ind., Meriden, Conn., Scranton, Pa., Taunton, West Lynn, and Pittsfield, Mass.

IT'S A GREAT HACK SAW BLADE

THIS MILFORD FLEXIBLE REZISTOR!

SAFE...
Replaces all hard blades for all users . . . skilled or unskilled

ECONOMICAL...
Delivers full cutting life . . . no accidental breakage

- **Cannot break or shatter in the frame.**
- **Faster and greater production per blade.**
- **Made from a new high-speed steel for longer cutting life. Only the teeth are hardened . . . the back is tough and flexible.**

Plus

"EASY-STARTING TEETH" IN ALL HAND SIZES . . . EXCLUSIVELY MILFORD.

Order from your mill supply distributor. He is always ready to serve your needs for all factory and mill supplies, as well as Milford hack saw and band saw blades.

MILFORD FLEXIBLE REZISTOR is the answer to your HACK SAW cutting problems

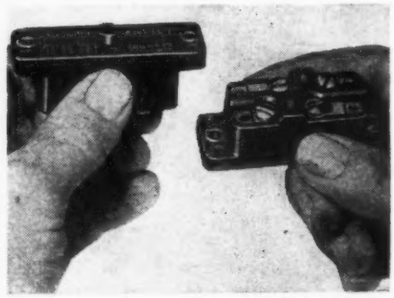
MILFORD
PROFILE AND BAND SAW BLADES
REZISTOR AND DUPLEX HACK SAW BLADES

THE HENRY G. THOMPSON & SON CO.
Saw Specialists Exclusively for Over 65 Years
NEW HAVEN 5, CONNECTICUT, U. S. A.

valve when fully loaded. Unit comes in a range of sizes, to deliver lubricant from original containers of 25-, 35-, 100-, and 400-lb. capacity. Alemite Div., Stewart-Warner Corp., 1826 Diversey Parkway, Chicago 14.

SNAP SWITCH

Self-contained, Class 9007 Type A snap switch is constructed to make or break a circuit in small space, with short move-



ment, and light pressure. Small in size (approximately 2½x1x⅞ inches), it operates on 550 volts. Square D Co., 4041 North Richards St., Milwaukee 12.

COOLANT CUP

Gravity feed reservoir for coolant or cutting oil holds a supply of coolant which is flowed or dripped to the cutting tool through a 9-in. flexible metal hose. Ad-

justable shutoff cock permits control of the liquid. The cup can be attached to any metal-working machine. In two sizes, cups have capacities of 1 or 2 quarts. Tru-Punch, Inc., 14-16 Littleton Ave., Newark 7, N. J.

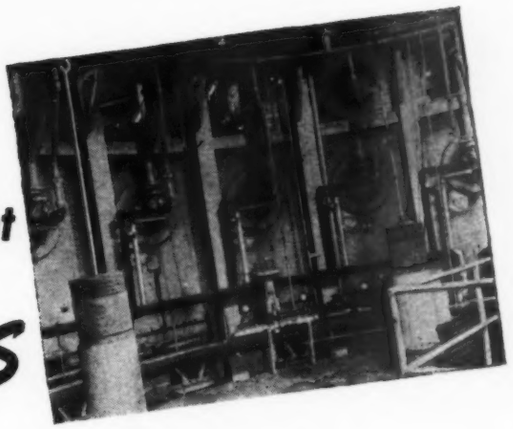
World's largest rotary furnace

AT

The Timken Roller Bearing Company plant

CANTON, OHIO

proves adaptability of GAS

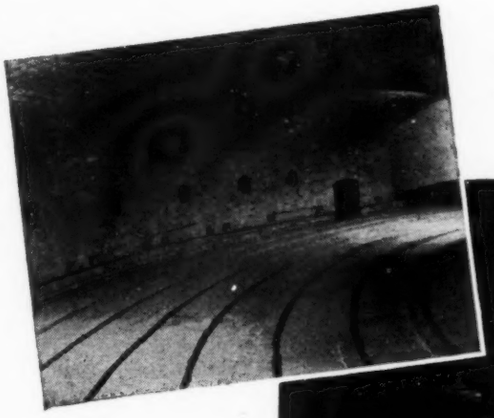


An outstanding example of adaptability of Gas and Gas equipment in successfully solving any industrial heating problem is seen in the world's largest rotary furnace used to heat alloy steel billets for piercing into seamless steel tubing at the Canton, Ohio plant of The Timken Roller Bearing Company.

Here, equipment engineers were called upon to build a furnace for heating round billets up to 10" in diameter and 12' in length, which would do the job more economically than existing equipment.

The result is this Gas giant with 2100 sq. ft. of hearth area and a capacity of 80,000 lb. per hour, when heating billets up to 2250 °F. Speed of the hearth ranges from 2 to 8 hours per revolution. Temperature control is fully automatic and a single operator can determine the temperature and location of each billet at any instant during the heating period. Since the start of operations, this Gas furnace has saved an average of 2% in scale loss alone. Maintenance costs are at a minimum and six men per turn were released for other plant duties.

You, too, will find that Gas equipment manufacturers have a rare understanding of your problems and how to solve them. Consult the Industrial Engineer of your local Gas Company, who is your liaison man with the entire Gas Industry.



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420 Lexington Ave., New York 17, N. Y.

THE TREND IS TO GAS

FOR ALL INDUSTRIAL HEATING

A master tool for industrial workmen — plant electricians, plumbers, maintenance men, garage mechanics, and even for the handyman householder.

The Star "Moly"* High-Speed Steel blade is recommended for jobs where speed and accuracy must be combined. The Star Unbreakable Special Flexible blade is ideal for all-around cutting where toughness and a certain flexibility are important.

METAL CUTTING

Get your copy of this pocket-size booklet on Metal Cutting. You will appreciate the practical suggestions on the selection, use, and care of hack saw blades.

*T. M. Reg. — *Blades bearing the name "MOLY" are made only by Clemson Bros., Inc., and affiliated companies.*

TRADE MARK

CLEMSON

CLEMSON BROS., Inc., Middletown, N.Y.
Makers of hand and power hack saw blades, frames, metal cutting band saw blades and the Clemson O-T power machine

you want to know

more about the items on this page

Letters to the addresses given will bring you further information.

PLASTIC VENTILATING INNERSOLES for workmen's shoes offer protection from athlete's foot and blisters when worn in hot, cold, or wet areas. Dale Vent-O-Sole, 60 East 42nd St., New York 17.

LIQUID INSECTICIDE contains DDT crystals which come to surface after compound is brushed onto screens, ceilings, fixtures. Said to be effective several months. Sherwin-Williams Co., 101 Prospect Ave, Cleveland.

AIRPLANE TRAVEL INSURANCE problems which arise when company-owned planes are used, and means of providing protection at standard rates, are discussed in booklet, "Memo for Air-Minded Executives." Limited copies available. Bankers National Life Insurance Co., Montclair, N. J.

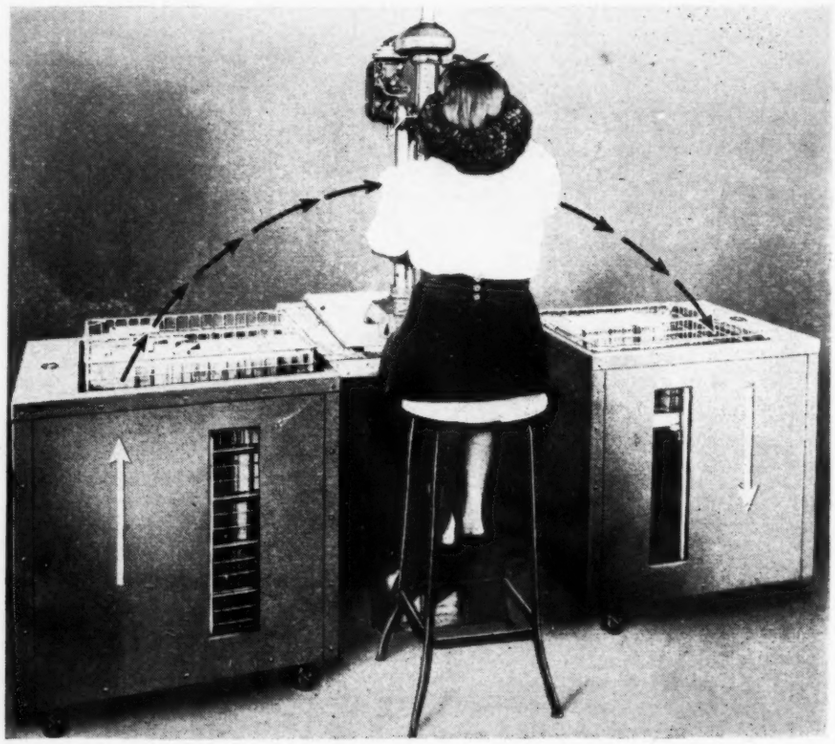
SEALING GREEN WOOD by chemical compound prevents sap and moisture from rusting steel in contact with wood. Bulletin. Nox-Rust Chemical Corp., 2425 South Halsted St., Chicago 8.

RUST PREVENTING agent is for use in water on ferrous metals before they are painted, enameled, or before machine operations. Geare-Marston, Inc., 1600 Arch St., Philadelphia 3.

INCH CONVERTER provides decimal equivalents of fractions of an inch, metric measures up to 100 mm., U. S. standard gage numbers, and drill numbers. American Hydromath Co., 145 West 57th St., New York.

FLEXIBLE PLUG GAGE HANDLE eliminates leader device on gaging member. enables operator to approach work within 20 degrees of hole axis and still get perfect alignment of piece part. Sapphire Products Div., Elgin National Watch Co., 932 Benton St., Aurora, Ill.

FOREMEN STRESS PROFITS in booklet "It's Our Dayton." Tells in simple language how "many people are trying to share in profits," points up how profits have aided growth of city and standard of living. Foremen's Club of



MATERIALS HANDLING by operator is simplified by rack with calibrated spring mechanism. Trays rise and fall with changing weight, keeping working surface within easy reach. Filled racks can be rolled away for storage. Lowerator Division of American Machine & Foundry Co., 511 Fifth Ave., New York 1

All Clear AFTER 9,000 HOURS

SUN DIESEL LUBRICANT...

Keeps Rings Free in Big Diesels for More than One Year of Continuous Operation

More than a year of continuous running, day and night . . . no stuck rings . . . no heavy sludge . . . no hard carbon . . . that's the record of a "Job-Proved" Sun Diesel lubricant in a big industrial power house.

The picture above shows a piston from one of the company's two 750-h.p., 6-cylinder, 4-cycle, Worthington Diesels after 9,000 hours of operation. The engine was shut down at this time only for routine inspection.

Performance like this is typical of the results being obtained by hundreds of Diesel operators in plants throughout the country, and in all types and sizes of Diesel.

Sun Diesel Lubricants have proved their ability on the job. They have extremely high resistance to heat, with minimum tendency to form gum or hard carbon. For continuous power output and low maintenance costs, call the Sun office near you today.

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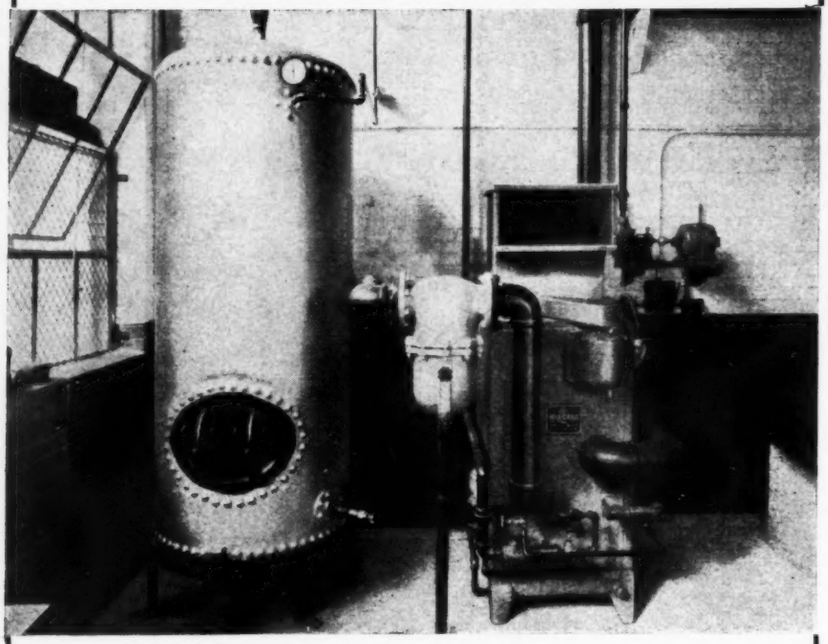
INDUSTRIAL PRODUCTS

NIAGARA *Aero*

AFTER-COOLER ASSURES DRY SANDBLASTING!



Many industrial plants answer the problems of rust in shot blasting and damage from condensed moisture in sandblasting with the NIAGARA *Aero* AFTER-COOLER. They report better than satisfactory results because of delivery of ***drier air***. This is in addition to the 95% saving in water costs and constant jacket water temperature advantages made possible by "*Aero*" cooling and the Niagara "Balanced Wet Bulb" control.

If sandblasting free from rust and moisture troubles is one of ***your*** objectives, be sure to send for NIAGARA bulletins 96 and 98 to prove further the profits you can make by employing the Niagara *Aero* After-Cooler.

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INDUSTRIAL COOLING HEATING • DRYING

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Dayton, 950 U. B. Building, Dayton 2, Ohio.

MODELS for sales presentations created by sealing photographs of product to plywood and cutting out to contour, leaving third dimensional effect. Photoettes by Isom, 1302 McGee, Kansas City 6, Mo.

WORK AND ACID SUIT coated with Koroseal resists abrasion, most solvents and acids. B. F. Goodrich Co., Akron, Ohio.

PROTECTIVE COATING for wood, metals, glass, fabrics, resists wear, temperature changes, many laboratory acids called Vulcabond, features quick drying, flame resistance. Bray Corp., Pasadena, Calif.

REHABILITATION FOR DISABLED, aids and programs available to industry are explained in booklet, "New Perspectives." National Society for Crippled Children & Adults, Inc., Room 920, 211 West Wacker Drive, Chicago 6.

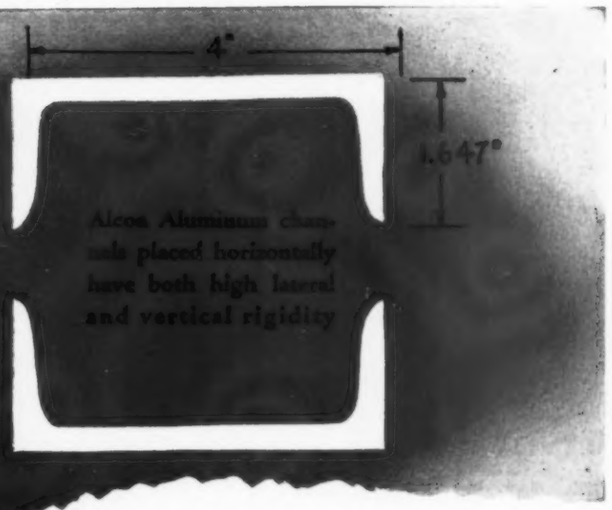
FASTENER of two-piece spring locking type has solid, one-piece stud fitting into cantilever-design plates. Lion Fastener, Inc., Honeoye Falls, N. Y.

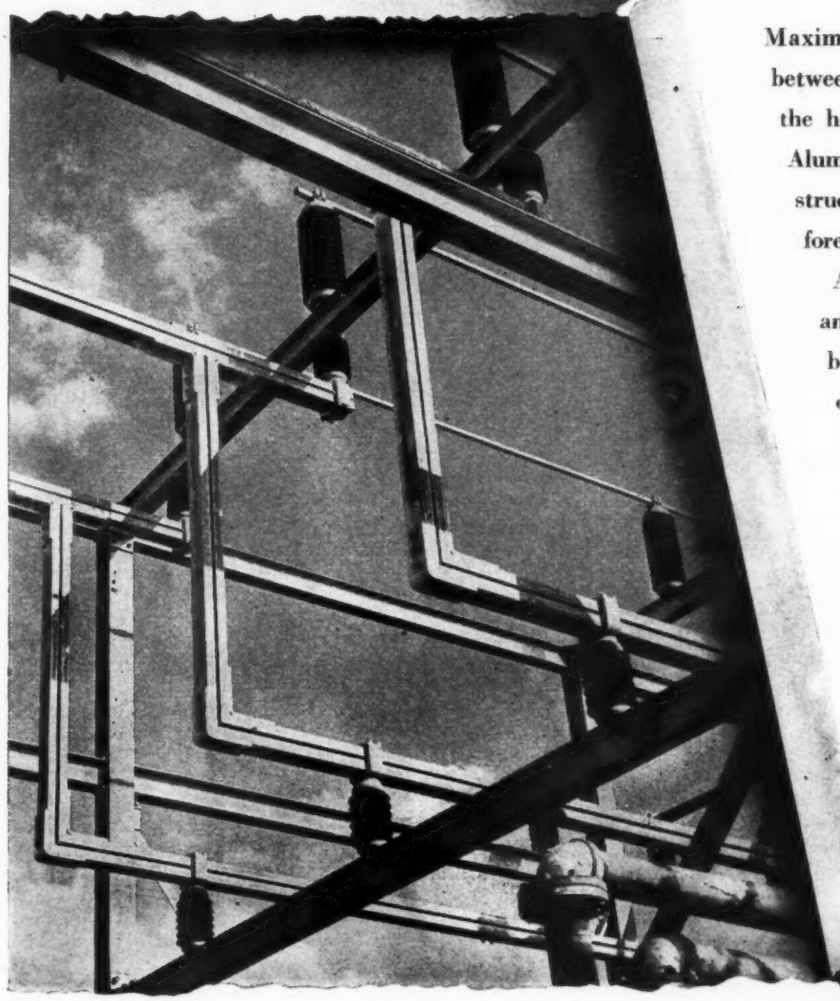
FILMS: *Dateline Tomorrow,* showing peacetime industrial uses of aluminum, in two-reel sound film. D. B. Hobbs, Aluminum Co. of America, Pittsburgh.

Our Industrial Air Power, sound-color film, shows uses of compressed air. Quincy Compressor Co., 304 Maine St., Quincy, Ill.

Doctor in Industry portrays development of industrial medicine over last 35 years. Div. of Public Relations, Film Section, General Motors Corp., 1775 Broadway, New York 19.

For greater resistance to short-circuit stresses, they placed the Alcoa Aluminum channels like this...





Maximum resistance to magnetic forces between phases is obtained here through the horizontal arrangement of the Alcoa Aluminum channels. The box-girder construction makes the buses rigid and, therefore, self-supporting on long spans.

Alcoa Aluminum channels, angles, flats and tubes make good-looking, efficient bus installations. High in electrical conductivity, low in weight, able to resist the elements, first costs are reasonable, upkeep low.

For quotations on Alcoa Aluminum for bus bars, fittings, housing materials and structural shapes, get in touch with the near-by Alcoa sales office. Or write ALUMINUM COMPANY OF AMERICA, 1900 Gulf Bldg., Pittsburgh 19, Pa.

ALCOA ALUMINUM

ALCOA
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American "5000" Marking Crayon — the perfect permanent mark for all rough and smooth surfaces. Ask your dealer or distributor for American "5000" Markers.

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1706 Hayes Avenue Sandusky, Ohio

SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Lecturer in Government Regulations, New York University and a Member of the New York Bar

Period Surveyed: May 1 to June 1

TREND INDICATORS

SUPERSENIORITY DENIED

A federal district court has once again ruled that the Selective Service and Training Act is intended to protect the seniority rights of veterans but not to guarantee superseniority rights at the expense of non-veterans with greater seniority. The Act assures a veteran that the time he spent in service will not handicap him unduly, but it does not give him advantages over his non-veteran fellow-workers. (Lord v. Nemenz, USDC W. Pa.)

VETERAN MAY NOT DISPLACE PERMANENT EMPLOYEE IN "COMPARABLE JOB"

Management may not dismiss a permanent employee to make room for a returning veteran in a "comparable job," where the veteran's former position has been largely abolished, unless the collective bargaining contract specifically provides for such procedure. Thus, where a permanent employee was fired to make room for a returning veteran whose previous job had been eliminated by a change in the company's operations, an arbitrator awarded the dismissed employee reinstatement rights plus back pay. (In re arbitration between Phoenix Publishing Company and Newspaper Guild of Philadelphia & Camden)

VETERANS' SENIORITY RIGHTS

The execution of a new collective bargaining agreement with a different union cannot serve to abridge a veteran's seniority rights. The signing of a new contract fixing all employees' seniority as starting at the date the contract was signed, is not applicable in the case of a veteran who has amassed seniority from the date he was hired, a difference of 9 years. The circuit court, deciding in favor of the veteran, declared that "it does not lie within the power of the employer to join with a collective bargaining agency in defeating the purpose and express language of the statute by bargaining away the seniority status of a veteran as it existed at the time of his induction into the armed forces." Rights awarded by the Wagner Act must be sublimated to the guarantees of the Draft Law, especially as far as a veteran's seniority standing is concerned. (Trailmobile Company, CCA-6)

TIMELY APPLICATION

The existence of a strike was deemed by an arbitrator sufficient reason for extending the contractual 90-day time limit on the period within which a veteran had to apply for reemployment if he wished to regain his old job. Under the contract making provision for reemployment of veterans on the same basis as the Selective Service and Training Act, the veteran would have been entitled to his old job without loss of seniority had he applied within 90 days of his discharge. However, at the expiration of his 90 days, the strike was still in progress. As explained by the arbitrator, the veteran's obligations and duties as a union member constituted a moral impossibility to communicate with the company during that time equally as effective as actual physical impossibility would have been. Just as the strike had the effect of extending the time within which the veteran had to return to work, it had the effect of extending the time in which he had to notify the company of his intention to return to work. (In re arbitration between Western Union Telegraph Company and American Communications Association)

REINSTATEMENT AWARDED

The importance of management's duty to reinstate has been illustrated in a recent case in which the court handed down a novel interpretation of a veteran's right to reemployment. The veteran, after being inducted into the Coast Guard, was reassigned to his previous employer's shipyards, with the employer contributing part of his pay. Subsequently, the veteran's relationship was terminated at the shipyards because of acts of insubordination. After being discharged from the Coast Guard, the veteran applied for reemployment in his former job, but the employer refused to reinstate him. The court, upholding the veteran's claim, pointed out that no relationship between the veteran and his employer during the course of his active military service could operate to defeat his right to reinstatement. (Dacey v. Bethlehem Steel Company, USDC Mass.)

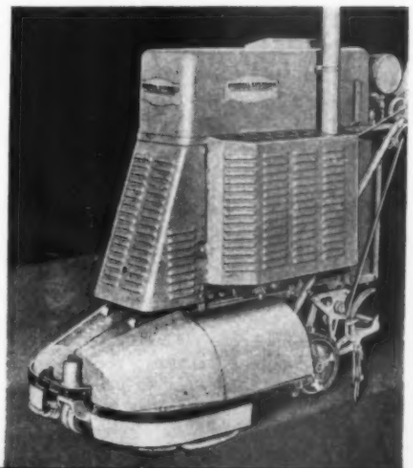
REINSTATEMENT DENIED

A federal district court ruled that reinstatement is rightfully denied a veteran where the latter, prior to his induction, did not hold a "position" in the employ of the company within the meaning of the Selective Service and Training Act. Thus, where a veteran held a position as straight-commission salesman, and, after discharge from the service, sought reinstatement in such position, the court denied him any reinstatement rights. Finding that the salesman

HIDDEN VALUES

OF THE CLEANSER THAT'S *SPECIALLY* COMPOUNDED FOR MACHINE-SCRUBBING

This type of Cleaning Compound—*Setol* for example—is designed for the greater speed of mechanical scrubbing. As a matter of fact, *Setol's* chemical action is *instantaneous!* And here's how it affects the over-all economy of machine-scrubbing: Because *Setol* keeps pace with the speed of the machine, operating time is reduced to the minimum required. This not only effects savings in labor costs, but prolongs the life of the machine. Mileage is not piled up needlessly as when a slow-acting cleanser is used. And conservation of mileage also conserves brushes—another of the *hidden values.*



In addition to *Setol,* the mineral oil solvent for use on mill and factory floors, *Finnell* also produces *Finola, the Original Scouring Powder,* and four other cleaning powders. All six are specially compounded for machine-scrubbing and are products of *Finnell's own powder mill.* For literature or consultation, phone or write nearest *Finnell* branch or Finnell System, Inc., 2507 East Street, Elkhart, Indiana. Canadian Office: Ottawa, Ontario.

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FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

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For less than 6¢ per square foot

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Rubberlike* RUNNER

Protects HEAVY TRAFFIC floors

Test Rubberlike on your toughest traffic spot. See how the sturdy corrugations cushion and quiet footsteps, how it cuts cleaning and maintenance costs. Note the "petty-cash" cost; less than 6c per sq. ft. This product of Bird research lasts and lasts under constant foot-poundings, gives longer life to good floors, new life to old. No installation—just unroll. Rubberlike hugs any surface without cementing, won't curl at edges. Makes slippery floors safe. It's non-skid even when wet, a boon where on-the-job splashings are safety hazards. In 25-yard rolls, 36" wide. Ask your supply house or write for free sample to Bird & Son, inc. Dept. 67, East Walpole, Mass. *Reg. U.S. Pat. Off.

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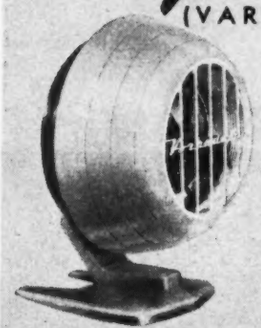
(VAR—NAY—DOE)
... begins where all others leave off



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Creating a true power vortex—Vornadofan gives seven times more circulation—33% longer range of effective cooling—greater rebound effect. Only by a demonstration can you truly appreciate this triumph of "fan" engineering.

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The greatest advancement in air circulation history—there's nothing like it on the American market. Don't install ordinary "fans"—install this air circulator that makes ordinary "fans" obsolete.

15 GREAT MODELS FROM WHICH TO CHOOSE

SEE YOUR DISTRIBUTOR OR WRITE DIRECT

Vornādofan
DIVISION OF THE
O. A. SUTTON CORP.
WICHITA, KANSAS

utilized his own sales methods without any restrictions or instructions from his employer, that he received no fixed salary but only commissions based on the number of items he sold, that he had no Social Security taxes deducted from his compensation, and that he was not included in the company's group insurance plan as were other employees, the court concluded the veteran was an independent contractor, having no right under the Selective Service Act to reinstatement. (Frank v. Tru-Vue, Inc., USDC S. Ill.)

REINSTATEMENT TO HIGHER JOB DENIED

A veteran is entitled to reemployment in his former position if he is honorably discharged and makes timely application; however it is to that former position that he may make claim, not to a job that he might have held if he had not been drafted. Such was the decision of an arbitrator who had presented to him a claim of a veteran that he was entitled to the position of foreman, which job, he maintained, he would have held if his promotion had not been interfered with by his induction into the armed forces. The arbitrator, upholding the company's action in reinstating the veteran to his former job as assistant foreman, stated that the Selective Service Act protects the position of a veteran as it existed before entering service; it does not require that the veteran receive more. Moreover, the arbitrator added, the fact that an employee was eligible for promotion before induction into the armed services does not mean that he is so qualified when he returns. (In re arbitration—Pet Milk Company.)

WAIVER OF EMPLOYEE CLAIM NOT BINDING

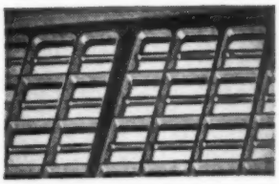
As a result of a recent decision handed down by the United States Supreme Court, an employee's *bona fide* release waiving any and all claims against his employer for overtime due is worthless and should not be accepted. In that case, the court held that an employee is not precluded from bringing suit against the employer for overtime due and liquidated damages by virtue of the fact that a *bona fide* settlement of a *bona fide* dispute over coverage of the Act has been made, and the employee has received the overtime compensation in full in accordance with the agreement. The high court, reiterating its reasoning from a previous case in which it held waivers not binding in the absence of a *bona fide* dispute, declared that even in the presence of such a dispute, a compromise of controversies over coverage would thwart the public policy of minimum wages by reducing the sum settled by Congress as proper compensation for withholding wages. (Schute, Inc. v. Gangi, US Sup Ct.)

EXEMPTION FROM OVERTIME PROVISION

The Wage-Hour Administrator states the following requirements for obtaining a partial exemption from the overtime provisions of the Fair Labor Standards Act under the operation of wage agreements guaranteeing annual wages: Employees must be working under an agreement which

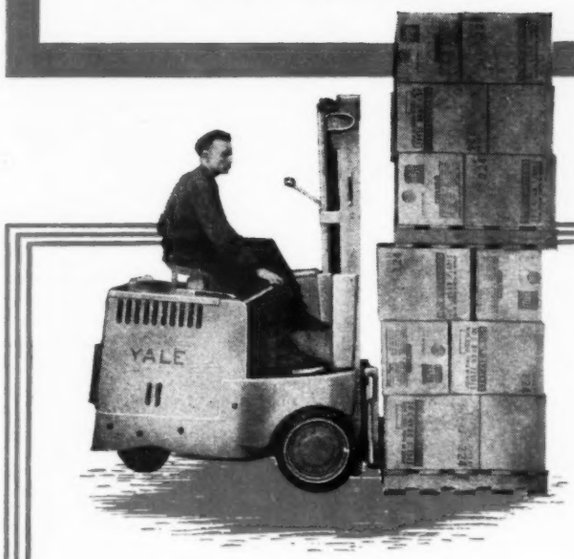
POWER
THAT PACKS A
PUNCH

Here's a Reason why



The Gould Kathanode grid has double-wedge shaped members that securely hold the active material, yet expose only a knife-like edge to surface erosion. Grids are tapered at the top for extra conductivity thus delivering more power at the terminals.

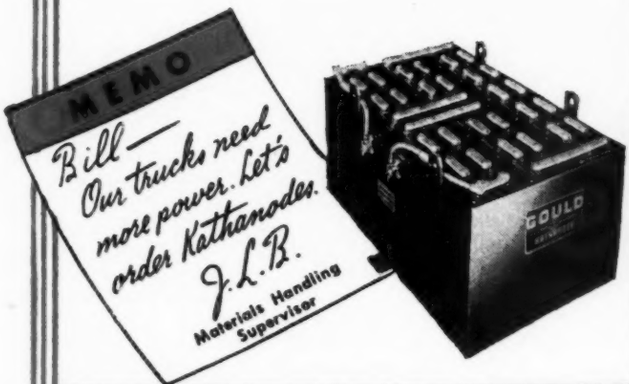
This grid is an exclusive Kathanode feature that provides more power and longer life. For all the facts write Dept. 17 for Catalog 100 on Gould Kathanode Batteries for Industrial Truck and Tractor Service.



GOULD KATHANODE BATTERIES
Deliver More Peak Voltage

Kathanode equipped electric industrial trucks have the punch necessary to meet unusual conditions. They will climb ramps, and have the extra power to operate hoists while the vehicle is still in motion.

THE BATTERY PICKED BY ENGINEERS



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ARMOURCLAD FIBRE COMBINATION DISC!

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In the days ahead, competition will be keen. To get increased volume you'll need the fastest tools and the best abrasives possible.

For better, faster finishing there are *specialized* ARMOUR ABRASIVES *designed* to do a *better job at less cost.* The faster, sharper, cooler-cutting *Armourclad Fibre Combination Disc* is only one of Armour's *complete* line of better metal-working abrasives.

It will pay you to call on Armour's experienced technicians. They will gladly help you choose the abrasives and methods which do your jobs best.

ARMOUR *Sandpaper* WORKS

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LABOR DEVELOPMENTS *(continued)*

limits the hours of work to 1000 in any 26 consecutive weeks, or 2080 in any 52 consecutive weeks, providing employment is on an annual basis. Thereupon, partial exemption from the Act requires time and one-half after 12 hours a day or 56 hours a week.

WAGE PREMIUMS NO PART OF REGULAR PAY

Wage premiums consisting of dividends on supposititious stock assigned to employees on the basis of length of service are not to be considered part of their "regular rate" of pay for compensating overtime. These premiums are declared by the board of directors and are therefore discretionary, as opposed to non-discretionary types of bonus payments, which must be included in computing rate of pay. Production or incentive bonuses would be included in the non-discretionary group. (Walling v. Garlock Packing Company, USDC S. N. Y.)

NOT TIME WORKED—PUNCH-IN TIME

An employees' claim for compensation for time spent on a line to punch a time clock at the beginning of the lunch period was held by a federal district court non-compensable since the amount of time so spent was not in excess of 3 minutes. The court, in so deciding points to the Wage-Hour Administrator's following interpretation as the proper test for such cases: "If the employer requires his employees to punch a time clock and the employee is required to be present for a considerable period of time before doing so, such time must be considered hours worked." Although in this instance the time was held non-compensable because it was not "considerable," payment for such time may be mandatory if the period of waiting is sufficiently long. (Cameron v. Bendix Aviation Corporation, USDC Pa.)

HELD TIME WORKED—SLEEPING TIME

Firemen's 8-hour "sleeping" shift, during a 24-hour tour of duty at the employer's premises. Although the employees' sleep is interrupted on rare occasions, nevertheless they are subject to call during that time, and are therefore included under the Act for overtime purposes. (Bell v. Porter USDC N. Ill.)

WAGE HOUR RECORDS

The dangers inherent in the failure of management to maintain adequate and accurate wage-hour records is limelighted in a recent court decision in which the court ruled in favor of the employee despite the fact that both employer and employee failed to keep records of hours worked. In the particular case, an insurance investigator brought suit against his employer, an insurance company, for back overtime pay due under the Fair Labor Standards Act. Neither the insurance company nor the employee kept any records of the overtime put in. While the burden of proof always falls upon the employee in such suits, in this instance the employee had only his memory as to the number of hours worked overtime each week to rely upon, the testimony of which recollection the court accepted;

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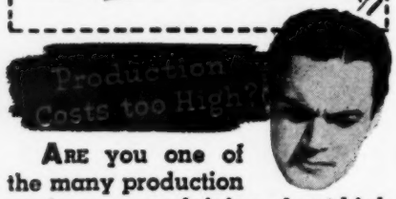

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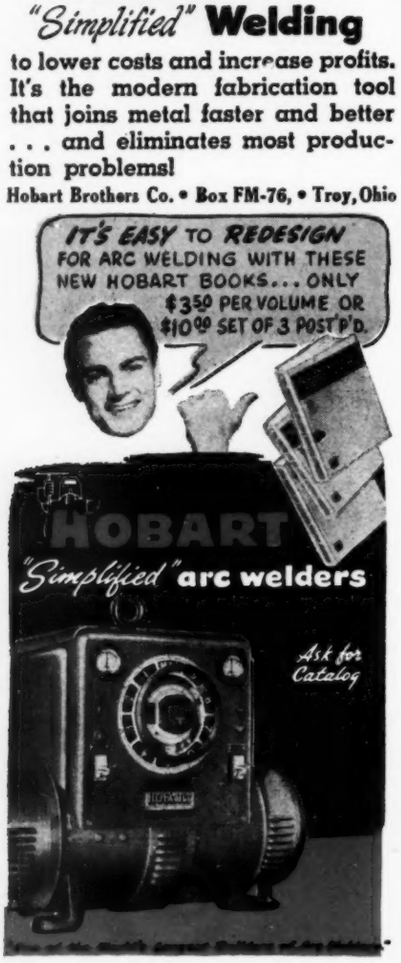

LABOR DEVELOPMENTS *(continued)*

proving to the court's satisfaction that he was required to work overtime and judging from the duties required from the investigator in his job, the court awarded him $436.40 in back overtime pay plus an equal amount in damages. (Johnston v. Firemen's Insurance Company, N. Y. Supreme Court, Spec. Term, Part I. Bx. County)

NO LIABILITY FOR CHILD LABOR

An employer, who in the past has had a careless attitude toward the employment of child labor, was nevertheless held not liable for "knowingly" employing boys under 16 years of age, who did not appear youthful at that time. The Secretary of Labor ruled that the evidence showed no lack of care in this case, inasmuch as any other careful contractors would also have omitted a check-up of age, under the circumstances. (Wilkins Trunk Manufacturing Company, Secy. of Labor)

LIABILITY FOR WALSH-HEALEY VIOLATION

Any person who has previously violated the Walsh-Healey Act and has been penalized by being placed on a blacklist which prevents his receiving government contracts, is liable to transfer the penalty to a firm allegedly operated by others. In a recent case, the court found that such a person who had a substantial financial stake in a new business was closely enough associated to transfer the penalty to the new concern. (Acme Sportswear Company)

HELD EXEMPT

Foremen group leaders who perform non-exempt work in excess of the 20 percent limitation. (Dolan v. Day, USDC Mass.)

HELD UNDER THE ACT

Service and maintenance employees of a building, tenanted by occupants who work on goods belonging to non-occupants of the building, who subsequently ship substantial portions of the goods to other states. (Schulte v. Gangi, US Sup. Ct.)

HELD NOT UNDER THE ACT

Trainees for yard brakemen jobs in a railroad terminal. Under the company's training program, trainees were supervised by regular crew members for a period of less than 2 weeks and were paid $4 for each 8-hour day of training, provided the training was completed satisfactorily. The court found that they were not "employees" within the meaning of the Act, inasmuch as their efforts were not necessarily and primarily for the benefit of the company. (Walling v. Portland Terminal Company, CCA-1)

RECONVERSION CONTROLS

WSB RULES ON DECREASES

The Wage Stabilization Board, handing down two recent decisions on the subject of

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.

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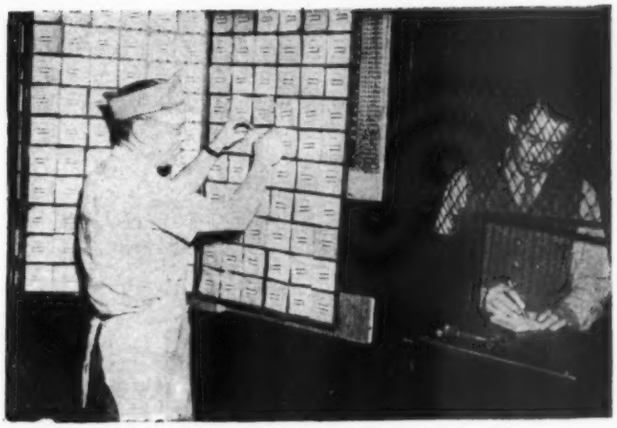
McCASKEY TOOL CONTROL

Tangible savings in tool costs and production time and how they were effected are outlined in the following abstracts from "Guard Your Tools", by Milton L. Borden, Tool Supt., Crocker-Wheeler Electric Mfg. Co. in the April 25, 1946 issue of American Machinist. They may suggest similar savings in your plant.



1—$3000 IN TOOLS RECOVERED:

Our first step was to scrap obsolete and unusable tools. A complete inventory of remaining items was taken and a notice issued requiring employees to return brass checks and tools. Results were astounding. We had returned better than $3000 in small tools that we neither knew had been issued, or where they were.

2—Faster Service—More Production:

Many workers, especially if piece workers, at first object to signing tool loan slips, claiming it takes too much time. We have refuted this many times by making time studies over a 10 or 24 hour period of the transactions at a given tool crib. We have found 500 to 700 transactions during a study, each taking an average of 30 seconds.

Under the old brass-check system, we have determined that individual transactions take an average of 1.4 to 2.2 minutes, most of this time having been spent in searching for the brass check, searching for the tool and arguments between crib men and operators. Less non-productive time at tool cribs means more production at the machine.

3—Reduced Tool Stocks and Purchases:

Three different times we have reduced our tool stocks until now we are operating with a 40% reduction in the total number of tools, but with more and better tools of the right kind. We have reduced tool purchases by approximately 60%

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A monthly record of breakage is sent to management for further steps considered necessary, whether the fault lies with operator, method or operating condition. A report for each operator shows whether he is costing us more in broken tools than he is worth in production.

5—Tool Cribs and Attendants Reduced:

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6—Lost Time at a Minimum:

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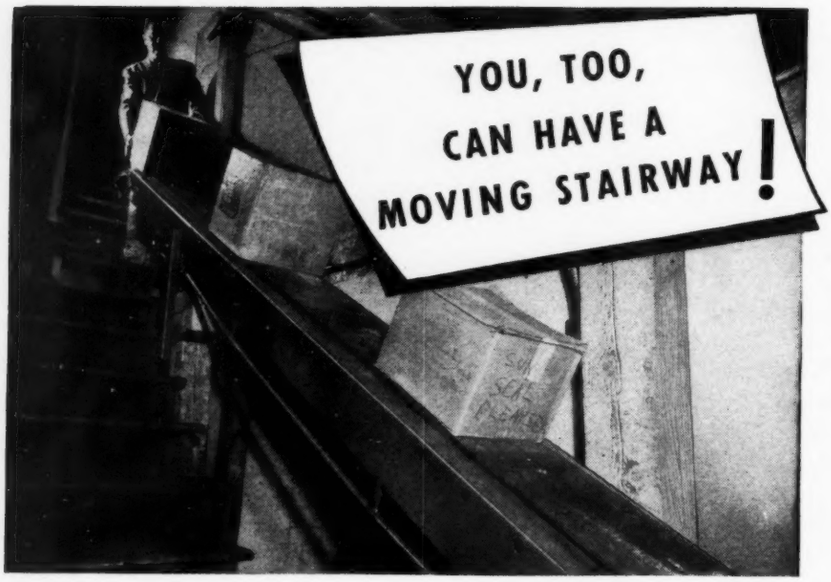

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wage decreases, permits reduction in overtime in one case to correct "inequities" and disapproves reduction in another. In the first case, the employer had been paying its part-time employees overtime for all hours worked in excess of their scheduled weekly hours, which were from 27 to 30 a week, while it paid its full-time employees overtime for hours in excess of 40 a week. Such method of paying overtime had created serious intraplant inequities between these two groups of employees. In addition, this practice did not conform with the method used in the rest of the industry in that area. The board consequently authorized the company to reduce overtime payments for its part-time employees on the basis that an "inequity" was being eliminated. (L. Bamberger & Company, WSB-N. Y.)

In the second case, the board refused to permit a company to discontinue the payment of daily overtime to a group of employees and return to weekly overtime payments, because no "inequity" was found to exist. During the war, this company was required to pay all employees subject to the Public Contracts Act overtime over 8 hours a day. Voluntarily, the company extended this practice to its salaried employees receiving less than $46.40 a week who did not come under the Public Contracts Act. The company requested a discontinuance of this daily overtime, but the board refused on the ground that, although generally a change from overtime under the Public Contracts Act to overtime under the Fair Labor Standards Act does not constitute a wage decrease, nevertheless the action in this case was voluntary on the part of the employer. (Federal Cartridge Corporation, WSB-N. Y.)

WSB FORM 9 TO BE USED FOR WAGE INCREASES

A new Form 9 has been issued by the Wage Stabilization Board for the use of employers who give their employees a lawful wage or salary increase and who have no *present* intention of using the increase as a basis for seeking a price adjustment or for increasing costs to the government. This Form 9 is to be filed with the nearest regional office of the Wage and Hour and Public Contracts Division, within 30 days after the increase is put into effect, and employers retain their right to apply for price or cost approval at any time *in the future*. This new form should only be used for increases which do not require prior approval of the Wage Stabilization Board or its agency. Otherwise, Form 10 is to be used.

*INCREASE DENIED AS BASIS FOR PRICE RELIEF

The Regional Wage Stabilization Board has denied a company the right to use the full amount of a wage increase ordered by an arbitrator for the purpose of price relief, because only part of the arbitrator's award can be justified. Although the arbitrator decided that 17½ cents was the "general pattern" for increases in the industry, the board rejected the pattern and allowed only

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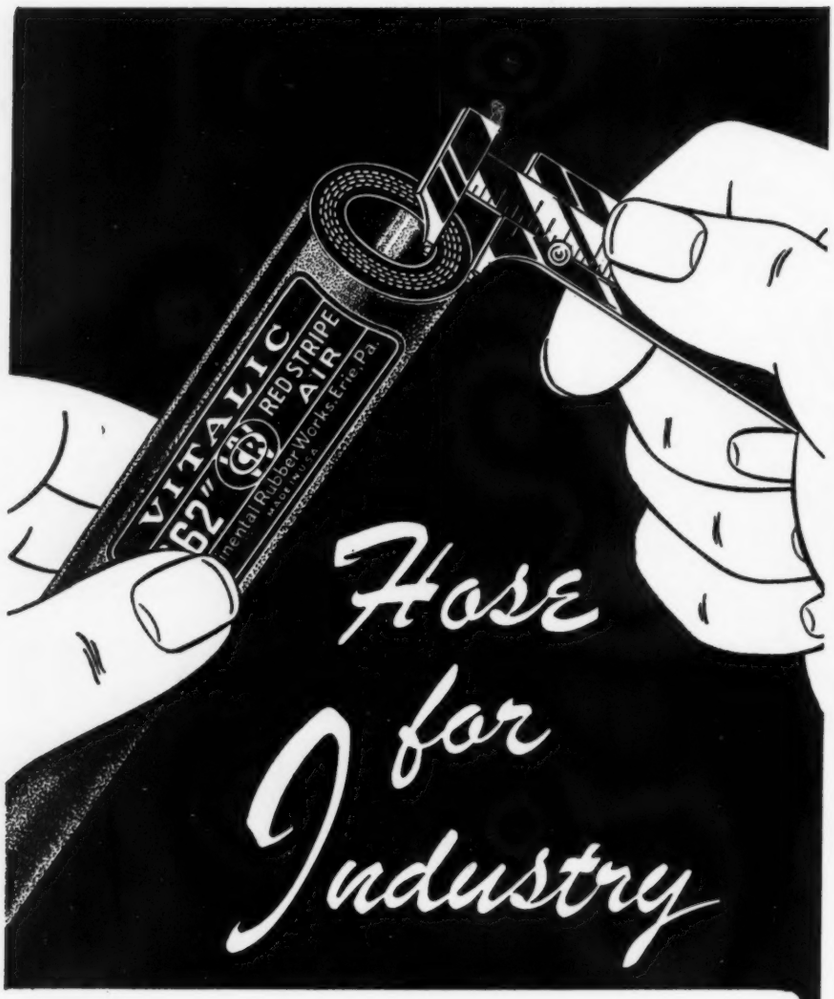

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***WSB DISAPPROVES REDUCTION**

An agreement between a company and a union to reduce the wages of certain employees because of old age was disapproved by the WSB, inasmuch as it could not be shown that these employees' production rates had decreased to such an extent as to cause an "inequity" in relation to other employees. (E. Albrecht & Sons Company, WSB-St. Paul, Minn.)

***DISCONTINUANCE OF BONUS PROHIBITED**

An employer, who discontinued the payment of a Chrismtas bonus to employees represented by a union and continued it for non-union employees, was held to be in double violation. His defense—that continuance of the bonus for the bargaining unit would have violated the Stabilization Act—was not made in good faith, and the board found him guilty both of violating the Stabilization Act and of refusing to bargain, in that the union was not consulted on the discontinuance. (Sullivan Dry Dock & Repair Corporation, NLRB)

***PENSION CONTRIBUTIONS EXEMPT FROM WAGE CONTROLS**

The National Wage Stabilization Board has ruled that employer contributions to a union's pension benefit fund in the amount of 1 percent of gross payrolls do not constitute "wages" and are therefore exempt from wage controls. This decision reverses a prior ruling in connection with the building and construction industry in which employer contributions were considered "wages." If, however, employee benefit plans are to be regarded as exempt: (1) Contributions under the plan must go into a "fund" rather than directly to individual employees, the fund itself is to be used only as an accumulation of benefit funds; (2) payments for the fund must cover risks such as death, retirement, illness, injury, or unemployment; (3) independent administration of the fund; (4) the benefits to be paid out from the fund must be "reasonable," as is required under Section 10 of the Stabilization Act.

NATIONAL LABOR RELATIONS BOARD

***REDETERMINATION OF BARGAINING UNIT**

When reconversion is coupled with a substantial decrease in personnel and material change in the nature of operations, the NLRB will entertain a petition for the redetermination of representatives in less than one year. In the case of one company, subsequent change-over from war to civilian production after the cessation of hostilities resulted in (1) a complete change in the employer's operations and processes and (2) a reduction in personnel by 70 percent to the pre-war level. A majority of the remaining employees petitioned the employer protesting recognition of the union which had won the consent election, and sought representation by the rival union

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LABOR DEVELOPMENTS *(continued)*

which had previously represented the employees before the tremendous wartime expansion of the plant. The board stated that when an employer's personnel has been cut back to its pre-war size, by reconversion, and when this, together with the appropriate circumstances, may warrant a redetermination of representatives or of the appropriate bargaining unit, a new petition for investigation and certification of a collective bargaining representative may be filed with the board. Mere reduction in size of the unit, however, is not sufficient. There must be other appropriate circumstances such as a material change in the company's operations or processes and a contraction of the unit, which necessary prerequisites were present in this particular case. (Electric Sprayit Company, NLRB)

***CONTRACT NO BAR TO RECLASSIFICATION**

Redetermination of the present bargaining agent is not barred, although the contract has 3 months to run, where the company entered into the contract while doing war work, and now that normal production has been resumed, many classifications are not included in the contract. The board held that inasmuch as the employees described in the contract were not representative of the skills included in its terms, the contract did not bar a present determination of representation. (In re arbitration between American Radiator & Standard Sanitary Corporation and International Association of Machinists, Local 824)

STOCKHOLDER BARRED FROM BARGAINING UNIT

Although mere ownership of stock in a corporation does not prohibit the inclusion of a stockholder in a collective bargaining unit, the NLRB held that director-employees and stockholder-employees of a small furniture manufacturing company are excluded from the bargaining unit inasmuch as their interests are *incompatible* with those of rank-and-file employees. (Union Furniture Company, NLRB)

***BARRING RIVAL UNIONS**

The National Labor Relations Board takes one more step in its program of stabilizing the collective bargaining process by eliminating an obstacle to the renewal of an existing collective bargaining contract. Under its newly enunciated doctrine, a challenging union's claim that it represents the majority of employees will not bar renewal of the contract with the union presently recognized as the bargaining agent *unless* the challenging union, in addition to asserting its representation claim, files, within 10 days, a petition with a regional office of the board, thus enabling the board to make investigations of the union and determine the substantiability of the claim and discouraging those unions which do not have justifiable claims. This technique eliminates the abuse of the board's former rule whereby a rival union could block renewal of the contract for an indefinite period by merely giving notice of its claim. As stated by the board, the bargaining process would be too greatly

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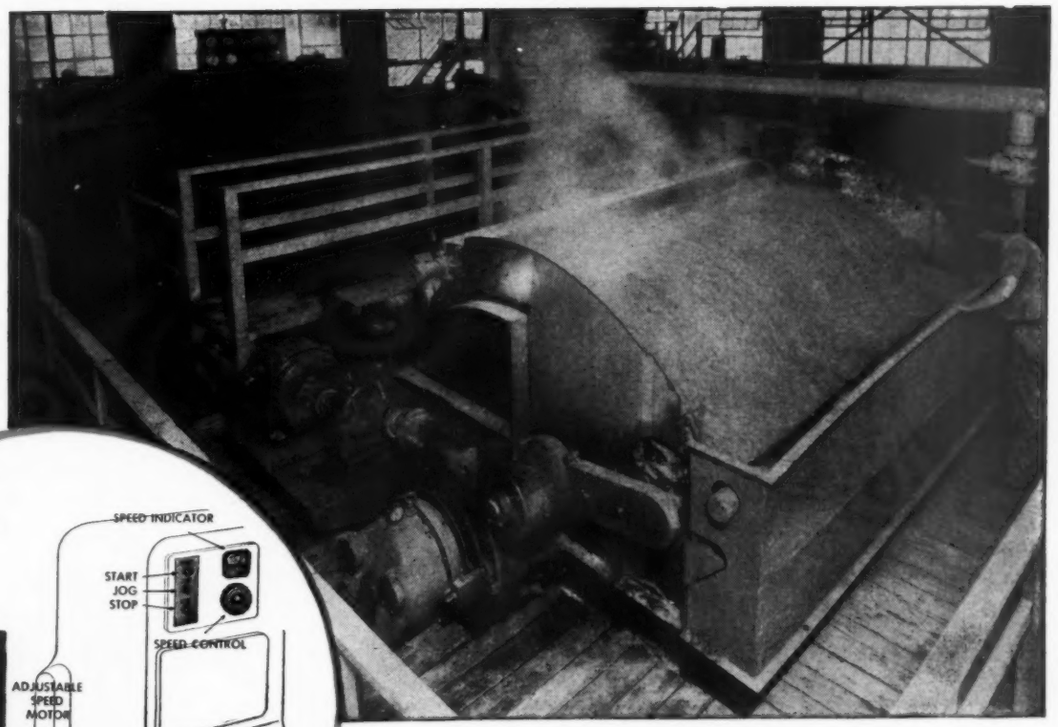

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impaired if such claims were permitted to defeat, without limitation as to time, a subsequent but otherwise valid collective agreement.

Thus, in the case involving this ruling, the board held that since the petition was filed more than 10 days after the assertion of a bare claim of representation, and no extenuating circumstances appeared, the agreement, otherwise valid, which was executed in the interval should be deemed to constitute a bar. (General Electric X-Ray Corporation, NLRB)

However, failure to file such petition after presenting a representation claim does not discredit the rival union's claim where the contracting parties enter into post-contract negotiations and thus "open up" the contract. Such action on the part of the contracting parties after the execution of the renewal agreement renders a rival union's pending petition valid although the union does not follow it up by a filing of such petition with the board. (Olin Industries, Inc., NLRB)

CHALLENGE TO BARGAINING UNIT

Unions or employers may challenge a ballot only at the time of the election, according to the NLRB, even though board policy now permits an initial hearing after an election rather than before an election. Thus, when a union after the election challenged the ballot cast by a supervisory employee not covered by the bargaining unit, the board held that the union waived its right to object at a subsequent hearing, since it failed to challenge the ballot at the time of voting. (Price Spindle & Flyer Company, NLRB)*

RIGHT TO REFUSE TO BARGAIN

An employer is not justified in refusing to bargain with a union (1) on the ground that it was never certified by federal or state labor relations boards, or (2) because a union-shop contract is insufficient proof that a majority of the employees desire representation by the union. The Connecticut Labor Relations Board held that the employees' membership in the union indicated their desire to be represented by such union. If this were not the case, the employees could have requested an investigation by the State Labor Board, into the union's claim of majority status. However, inasmuch as this was not done, it is clear that the employer is obligated to bargain with the union. (Bridgeport Coat & Apron Supply Company, Conn. NLRB)

MANAGEMENT'S DUTY TO BARGAIN

Where substantially all the members of a union signed a petition stating that they did not want to be represented by the union, the board held that the employer was still obligated to bargain with the union, because he had refused to bargain prior to receiving the petition. It was found that the employees were not free to revoke the union's authority after its majority status had been established, and that the defection in the union's ranks was caused by the

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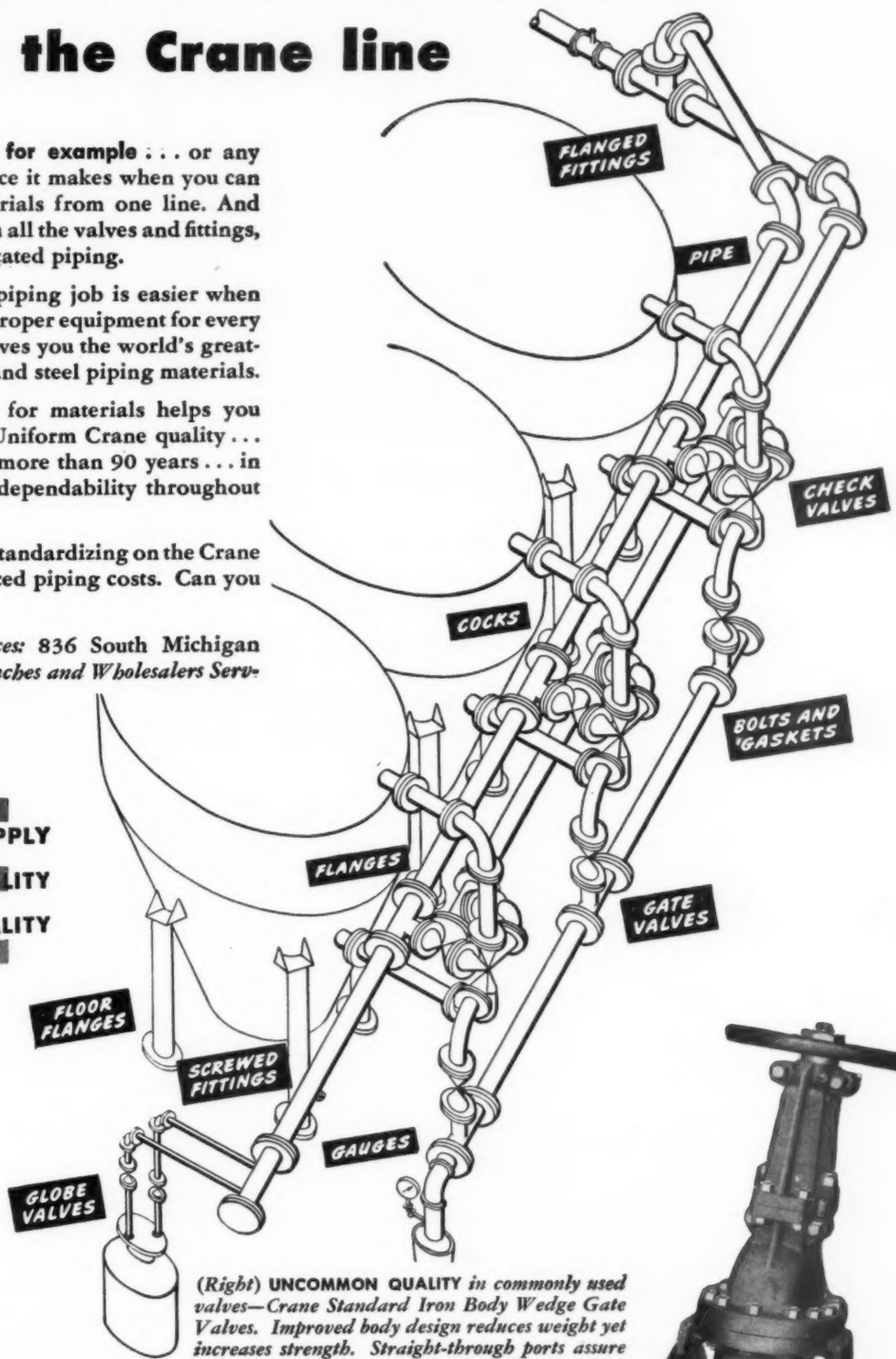
Undivided responsibility for materials helps you get the best installations. Uniform Crane quality . . . the standard of quality for more than 90 years . . . in every part means uniform dependability throughout piping systems.

This 3-way advantage of standardizing on the Crane line is the sure way to reduced piping costs. Can you afford to overlook it?

CRANE CO., *General Offices:* 836 South Michigan Avenue, Chicago 5, Ill. *Branches and Wholesalers Serving All Industrial Areas.*



ONE
SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY

(*Right*) **UNCOMMON QUALITY** *in commonly used valves—Crane Standard Iron Body Wedge Gate Valves. Improved body design reduces weight yet increases strength. Straight-through ports assure streamlined flow. Every detail developed to give dependable, durable service. For steam pressures up to 125 pounds; 200 pounds cold. Patterns for every need. See Crane Catalog, page 101.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
HEATING • PUMPS

CRANE

FOR EVERY PIPING SYSTEM

Buffalo STAINLESS STEEL
Bolting Cloth
FOR FASTER, MORE UNIFORM SCREENING OF LIGHT OR POWDERY SUBSTANCES
Freer bolting—smooth, polished surface avoids blinding
Fast, all-weather efficiency—unaffected by moisture or humidity
Rust and corrosion resistant
No contamination or discoloration
Durable—lasts up to 4 times life of many other fabrics—"wears clean"
Higher tensile strength
Lower operating cost
Available in rolls or panels
★ Folder 590 contains useful information worth filing. Write for free copy.
Buffalo WIRE WORKS CO., INC.
440 TERRACE BUFFALO 2, N. Y.

..handles food products with "complete satisfaction"

The Mayfair Food Products Co. of Chicago says this about their TOTE-ALL Conveyor:

"We are using it in our tank-filling operation and find it handles our intake of green pickles very satisfactorily . . . . we do not hesitate to recommend the TOTE-ALL Conveyor."

This is only one of many bulk products handled by the speedy, TOTE-ALL Conveyor. Industry uses these conveyors for sand, coal, brick, clay, fertilizer, gravel, grain, etc. TOTE-ALL comes in two lengths, 14 ft. and 20 ft. Gasoline or electric unit optional.

You can save time, money and equipment with a TOTE-ALL . . . get full details today. Write for Bulletin FM. (If you are handling packaged material ask for details on the new TOTE-ALL Package Conveyor.)

Tote-All

MATERIAL MOVEMENT INDUSTRIES
(formerly Coaltoter Conveyor Co., Not Inc.)
310 S. Michigan Ave., Chicago 4, Illinois

PORTABLE POWER CONVEYOR

employer's unlawful refusal to bargain. (Wilson & Company, Inc., NLRB)

Even though an employer suffers a drastic loss of business, because of a boycott instigated by a union which lost an election in his plant, the board holds that he is still obligated to bargain with the winning union. The losing union caused the employer to lose several good customers, and the loss of orders brought the employer close to bankruptcy. Nevertheless, it was held that hardships caused by a minority union do not present the employer with an excuse for failing to bargain with the majority union. (Lakeshore Electric Manufacturing Corporation, NLRB)

***MANAGEMENT'S RIGHT TO DENY JOB**

An employer who failed to hire an applicant because of his stubbornness and bad temper did not act discriminatorily, even though he knew that the applicant was active in union affairs. The fact that the employer investigated the applicant thoroughly, has employed other union members, and has shown no anti-union actions, indicates that his failure to hire the applicant was not based on the latter's union activities. (Firestone Tire & Rubber Company, NLRB)

***DISCHARGE JUSTIFIED**

In a recent case, it was found that there was "good and sufficient" cause under contractual provision for discharging an employee who might be likely to disclose his employer's trade secrets and technical information to his sons, who opened a business in direct competition with the father's employer. Although up to that time, the employer had no knowledge of any trade information being given away by this employee, nevertheless the arbitrator held that it was only natural for the father to talk business with his sons and, while doing this, might inadvertently disclose information to his employer's disadvantage. If after one year, however, the sons' business were to fail or his sons' connection with their business be discontinued, the employee is to be reinstated in his former position with all his seniority rights, but without back pay for that period. (In re arbitration between E. B. Sewall Manufacturing Company and United Steel Workers of America, Local 3346)

***DISCHARGE UNJUSTIFIED**

Although the employee involved in one case was not a union member, a state court upheld the Labor Relations Board's finding of discrimination in the employee's discharge. The company contended that the individual was discharged because of drinking, smoking in the lumber yard, and taking his children for rides in the company's truck. However, in the light of the following facts, the court concurred in the union's charge that the employee was discharged because of his union activities. Shortly before and at the time of his discharge, efforts were being made by the union through its business agents to unionize the plant. The employee was known to have signed an application to

3 TIMES FASTER SANDING!

STERLING SANDING IS 3 TIMES FASTER . . .

Leading furniture manufacturer eliminates slow, tiresome hand sanding. Sterling Sander does the same job in less than 1/3 the time . . . light weight, it needs only one hand to guide it over the work and even hard-to-reach parts can be sanded for long periods without causing fatigue.

. . . THAN TEDIOUS HAND-SANDING

All types of wood, metal and plastic products can be sanded faster with the Sterling 1000. Furthermore, this simple-to-operate vibrationless sander produces a smoother, more uniform surface. Use it for coarse or fine sanding, lapping and polishing—on flat or curved surfaces!

Write now for folder giving complete information. Sterling Tool Products Co., 383 East Ohio Street, Chicago 11, Illinois.

STERLING PORTABLE ELECTRIC AND AIR-DRIVEN SANDERS

TO ATTACK HEAT SICKNESS IN YOUR PLANT

"PASS the SALT"

THIS is a Sterling Salt Tablet. It attacks the *cause* of heat sickness scientifically and surely by replacing the body's salt as it is lost through excessive perspiration.

It can greatly reduce the toll of heat sickness in your plant this summer . . . 4 to 6 tablets a day with water are normally sufficient for protection.

Install handy Sterling Salt Tablet Dispensers—at drinking fountains throughout your plant—now. They make tablet dispensing easy—act as effective reminders to your workers to take one of these pure, grain-accurate tablets every time they take a drink.

Sterling Salt Tablets of purest, compressed granulated salt

Quantity	*Size*	*Price*
Case 6/1500's	10-grain	$2.60
Case 24/500's	10-grain	3.50

EXTRA ENERGY SALT AND DEXTROSE TABLETS

Case 6/1500's	9-grain	$3.05

Sterling Tablet Dispensers—durable plastic housing; one-at-a-time supply feature

500-tablet size	$3.25
1000-tablet size	4.00

All prices include delivery

Sterling offers you *FREE* safety posters. Here's the Sterling Salt Tablet story in a nutshell for your workers. Displayed prominently in your plant, it helps ward off heat sickness . . . saves man-hours waste. Write today.

Sterling SALT TABLETS

INTERNATIONAL SALT COMPANY, INC., Scranton, Pa.

LABOR DEVELOPMENTS *(continued)*

join the union and had been active for the union in obtaining other applicants for membership. The employee was asked by his employer whether he had joined the union. Upon being discharged, the employee was given no reason for such action. Furthermore, the employer indicated an open opposition to the unionization of his plant. In view of these supporting findings, the court awarded the employee reinstatement rights. (Chapin v. Penn. Labor Board, Pa. Ct. of Common Pls.)

BACK PAY DENIED

The NLRB denied strikers back pay for the period, a matter of 5 days in this particular case, that they did not know they had been discriminatorily discharged. When the strikers did learn of their dismissal, they offered to return to work but were denied employment by the company although their positions were still open. Back pay was awarded them from the date they made their offer to return to work. The board so decided the issue on the ground that the strikers considered themselves economic strikers for the 5 days in question. (General Motors Corporation, NLRB)

***SENIORITY DOES NOT EXTEND TO CHOICE OF JOB**

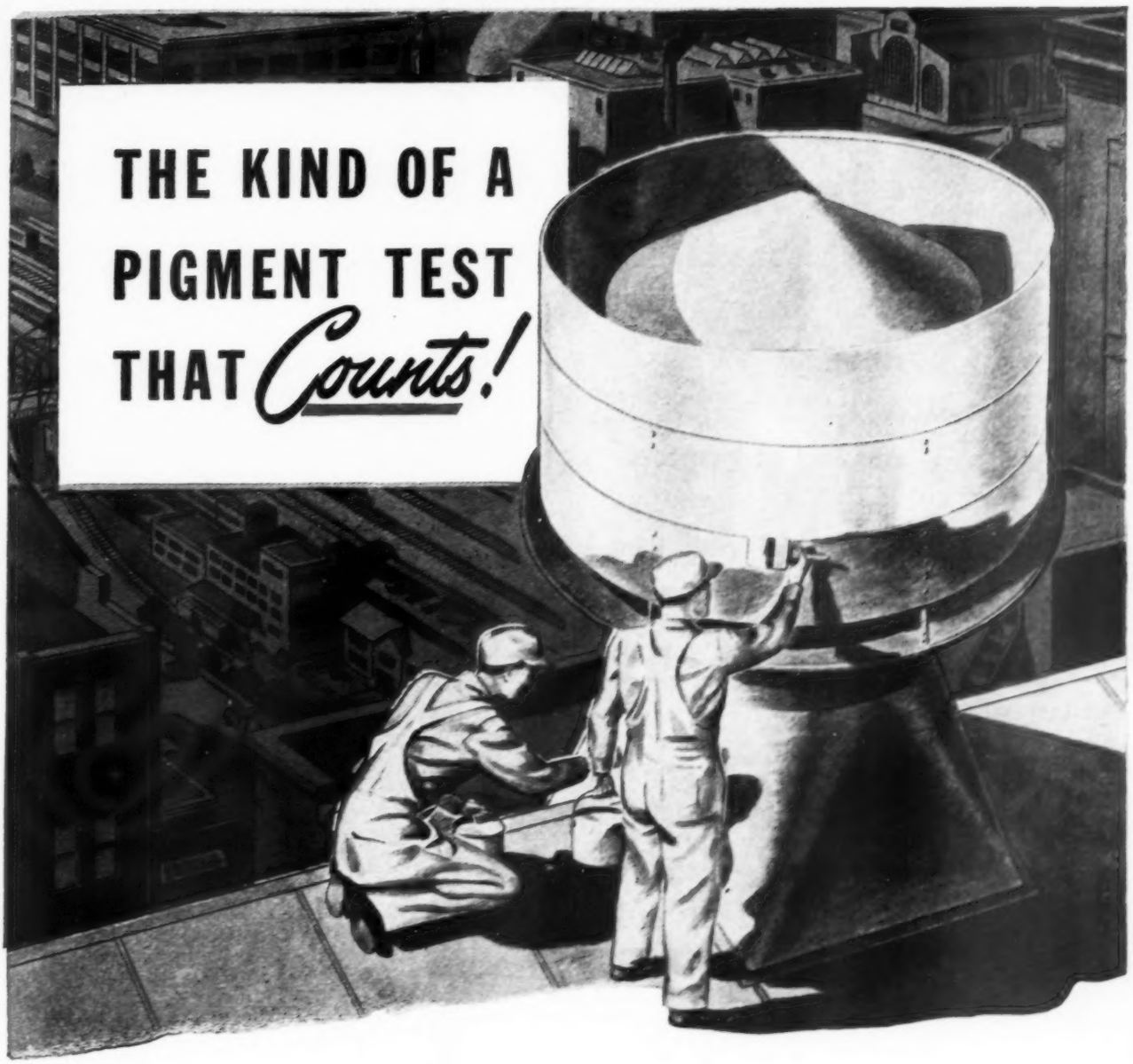
The fact that union stewards are contractually granted top seniority with respect to layoffs does not mean that they have the right to select any job remaining in the plant. A steward's refusal to accept a proffered job at the time his own job was eliminated was deemed by an arbitrator proper ground for his discharge. The steward had insisted on a job which he could not have satisfactorily performed because of demands made upon his time for union work. (In re arbitration between Brewster Aeronautical Corporation and United Automobile, Aircraft, & Agricultural Implement Workers of America, Local 365)

***FOREMAN'S RIGHT TO CHOOSE BARGAINING REPRESENTATIVE**

Top-level foremen and superintendents are to be given an opportunity to choose whether or not they will be included in the same bargaining unit with lower-level supervisors, the board has ruled. The two groups of supervisors are to be polled separately, and the results will indicate whether there will be one or two bargaining units for foremen. (White Motor Company, NLRB; U. S. Rubber Company, NLRB)

***WALKOUT—NO STRIKE**

A walkout of six incentive workers because of an unadjusted legitimate grievance did not, in an arbitrator's opinion, constitute a "strike" warranting discharge for violation of the contractual clause forbidding strikes until the entire grievance procedure had been exhausted. The employees' grievance related to a substantial decline in their earnings for which no adjustment had been made and for which relief had been



The best pigment test of all comes when the painter on the job applies aluminum paint on an exposed metal surface like the ventilator shown above, and the Alcoa Albron pigment forms its almost continuous barrier of rustproof metal against moisture, fumes, and sun's rays. That test, which you can see in operation everywhere in industrial America, proves by the lasting brilliance of the aluminum paint that the combination of good vehicle and Alcoa Albron pigment is hard to beat.

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Always SWIVEL and ROLL

DARNELL CASTERS

All Darnell Swivel Casters feature a DOUBLE BALL-BEARING SWIVEL HEAD —assuring the easiest handling of the heaviest loads on any type floor.

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LABOR DEVELOPMENTS *(continued)*

denied by the company in the preliminary step in the grievance procedure. While the arbitrator conceded that proper disciplinary action was in line, he thought the discharge too severe in view of the facts that the employees had a just grievance, they had left work not with the intention of striking but rather because they were too upset to work, and at the time of the walkout, the employer did not consider it a work stoppage or notify them of discharge. (In re arbitration between Auto-Lite Battery Corporation and United Automobile, Aircraft, & Agricultural Implement Workers of America.)

***PRECEDENTS BINDING ON UNION**

The union's acceptance of past practice without objection binds it in the future in the same manner as if the practice were part of the union contract. Thus, where an employer had made it a practice to post a notice on the bulletin board to the effect that holiday pay would be forfeited if the employee were absent the day immediately preceding or following the holiday, an arbitrator declared that the union's present objection to the practice had no ground. (In re arbitration between Colgate-Palmolive-Peet Company and International Chemical Workers Union)

COMPANY UNION HELD DOMINATED

An inside union was held company dominated where both supervisory and non-supervisory employees were members, representatives of management participated in its formation, and the employer quickly agreed to a closed-shop contract when an outside union claimed majority representation. One of the main objections to the inside union was the fact that the supervisors lead the organization of the union of which they were members. The outside union, whose organization the board condoned, similarly admitted supervisors to its membership, but did not permit them to engage in union activities in the shop. (McHale Manufacturing Company, NLRB)

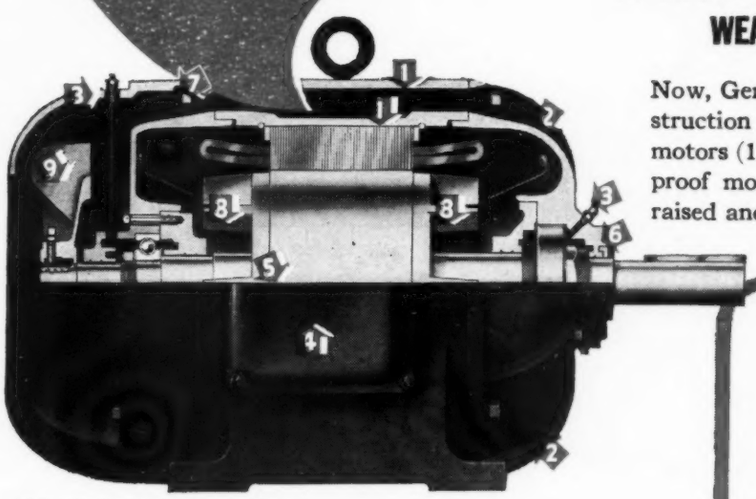
***AUTOMATIC PROGRESSION**

In two cases dealing with automatic progression plans, the problem of the lengthened work week was considered. Where the weekly hours were increased from 36 to 40, it was held that apprentices' advancement should be based on the number of hours worked rather than on the lapse of a certain length of time, such as one year, two years, etc. It was the company's practice to break down the apprenticeship time into a certain number of hours on various operations. It was also argued that the advancement an apprentice makes depends more on his improvement in skill than on a definite lapse of time. On the other hand, in the second case, the lengthened work week was deemed not to affect the advancement of common laborers. In this case it is lapse of time, and not skill, which is important, and, therefore, the progression should be counted by calendar periods rather than by actual hours worked. (In re arbitration between Standard Oil Co. (Indiana), and Central States Petroleum Union, Local 115)

A DOUBLE WALL *Keeps trouble out*

NEW *TRI CLAD* TOTALLY ENCLOSED MOTOR IS MORE FULLY PROTECTED FROM DUST, DIRT, WEATHER, OR WHAT-HAVE-YOU . . .

Now, General Electric has applied Tri-Clad construction to its line of totally enclosed induction motors (1 to 1000 hp) and to most of its explosion-proof motors as well. *Extra protection* has been raised another notch.



FOR EXTRA-SEVERE JOBS

Applications amid dust, metal filings, coolants, or corrosive agents, where totally enclosed motors have always been required, will now have the benefit of a stronger armor, plus convenience features that simplify installation and servicing.

FOR EXTRA-WET LOCATIONS

Indoors or out, these Tri-Clad totally enclosed motors will take hosings or heavy rains without danger of shutdown. The cast-iron frame is strongly resistant to rust and corrosion.

FOR EXTRA LONG LIFE

Many motor users are making the totally enclosed motor their standard for *all* jobs—based on evidence of long-term savings. This new member of the Tri-Clad line makes this decision more logical than ever.

HAZARDOUS ATMOSPHERES

"Companion motors" to the standard Tri-Clad totally enclosed, the new explosion-proof and dust-explosion-proof types are tested and listed by Underwriters' Laboratories for Class I Groups C and D, and Class II Group E, F, and G.

THESE 9 POINTS

of new strength and serviceability put this Tri-Clad totally enclosed motor way ahead

1. A cast-iron, double-wall frame that completely encloses windings and punchings
2. Ribbed cast-iron end shields, machined to provide a tight seal, yet easily removed
3. Well proved pressure-relief greasing systems which can be packed with a long-life lubricant where advisable
4. Cast-iron conduit box diagonally split for wiring convenience (independently explosion-proof on explosion-proof motors)
5. Leads are sealed in a nonshrinking compound at the point where they emerge from frame
6. Rotating, labyrinth seal prevents infiltration of grit or liquids
7. Large, free-flowing, easy-to-clean air passages protect parts from accumulation of dust and foreign matter
8. Modern "ageless" insulation treatment includes Formex* magnet wire
9. Powerful external fan is removable, simplifying maintenance. (Nonsparking type for explosion-proof motors.)

AND IN ADDITION—compactness and short length promote ease of handling and installation.

*Trade-mark Reg. U.S. Pat. Off.

GENERAL ELECTRIC

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FOR THE COMPLETE STORY

GENERAL ELECTRIC COMPANY
Apparatus Dept., Schenectady 5, N. Y.

Please send me GEA-4400, which describes the new Tri-Clad totally enclosed motor.

Please send me GEA-4131, "Motors and Control for Hazardous Locations."

Name.....

Company.....

Address.....

3993

While DUST HOG fattens on inefficiency, slowing up workers, ruining machinery, spoiling quality, causing accidents—maintenance costs go up. So the cost of *controlling* dust can usually be paid for out of savings in maintenance—and often by reclaiming dust by-products.

Clear out those "dust pockets" where DUST HOG is adding to your costs. A free booklet, "Control of Industrial Dust", shows how "plant housekeeping" is easier, cheaper with Pangborn equipment on the job. Write Pangborn Corporation, **282,** Pangborn Boulevard, Hagerstown, Maryland—*world's largest manufacturer of dust control and blast cleaning equipment.*

Pangborn

PANGBORN CORPORATION, HAGERSTOWN, MARYLAND

DUST

CONTROLLING IT IS PROFITABLE

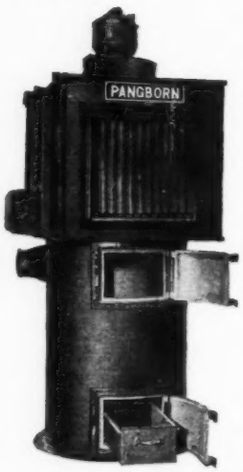
Here are several experiences of Pangborn customers that show what can be accomplished through efficient control of dust.

Manganese dust with a salvage value of $5.00 is removed each day by a Pangborn collector, and other savings amount to $1.50 per day. Yet operating cost is only $60.00 per year, and maintenance cost only $150.00 per year. The collector quickly paid for itself.

A musical instrument manufacturer uses wood dust for fuel, saving $2500.00 per year on coal bills. Operating cost is $1,200.00 per year and maintenance runs $650.00 per year.

Product quality is improved and plant maintenance greatly reduced by a soap manufacturer who pays only $120.00 per year for operating the Pangborn equipment and $60.00 for maintaining it. Value of salvaged soap powder exceeds this cost.

Dust—regarded in many plants as merely a nuisance—is often so expensive a liability that large savings can be made through efficient dust control. A Pangborn booklet, "Control of Industrial Dust", gives valuable information from the 41-year experience of Pangborn engineers. Address Pangborn Corporation, 282 Pangborn Boulevard, Hagerstown, Maryland.



FOR LOCALIZED "DUST POCKETS"

If your plant does not require a complete dust control system, consider Pangborn's new "CK" for locations where dust conditions are worst. The "CK" has many features of larger Pangborn collectors—yet it occupies minimum floor space, is easily accessible, requires little piping and installation expense. It is adaptable to a variety of work—grinding, polishing, buffing, blast cleaning, etc. Write for Bulletin 910. Pangborn Corporation, 282 Pangborn Boulevard, Hagerstown, Maryland. **Adv.**

HEADGEAR HEADACHE *by today's standards*

Yards and yards of material of the finest sheerest silk—carefully, almost religiously wrapped—provide the trim, tight-fitting turban of the celebrated Sikhs.

Its claim to fame is that it is unique, distinctive. It certainly is not practical or serviceable nor in keeping with the quick tempo of the times. Likewise, many fine products are also packaged in out-of-date containers that are costly and laboriously assembled.

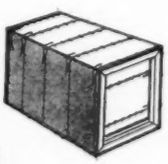
Bring your packing problems to us. Our engineers will be glad to help you design a *modern* container that really protects your product, that is actually a "part of the product."

Learn how you too can cut costs, conserve man-hours and speed production. It's a story of vital interest to you. Write to us . . . today.

NEW
"GENERALIFT" PALLETS

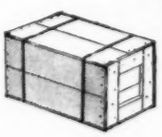
Millions of pallets were used by the armed forces. They saved from 50% to 90% in materials handling. We are now in full production of pallets for all industry. Our engineers will design a pallet best suited to your specific needs. Write today for free Pallet Book.

"Generalift" Pallet



General All-Bound Box

General Corrugated Box



General Nailed Box

General Cleated Corrugated Container

General Wirebound Crate

NOTE: *Shortage of timber products today is even more critical than during the war. This is due to adverse weather conditions, labor difficulties, pricing maladjustments, ear-marking and priority of lumber for erection of homes for veterans, etc. For these reasons, we, like so many others, cannot guarantee production and shipment in terms of usual schedules.*

ENGINEERED SHIPPING CONTAINERS

GENERAL *BOX COMPANY*

GENERAL OFFICES: **504 North Dearborn St., Chicago 10, Ill.**
DISTRICT OFFICES AND PLANTS: **Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon. Continental Box Company, Inc.: Houston, Dallas.**

N&F BINS

SUPER-CONCRETE STAVE AND MONO-LITHIC TYPES

Gravity or conveyor delivery of coal from bins direct to stokers.

Gravity or conveyor delivery of a score of flowable bulk materials to point of need, including

Grain, Kaolin, Alumina, Sand, Clay—anything that will flow.

A thousand or more in service, hundreds erected on high priority ratings past four years.

Any capacity, either type, any type conveyor required. Fast erection by N & F expert crews. Can be equipped for heating. Can be built to hold liquids.

If you need more bulk storage send for 1945 catalog. Super-concrete stave construction is fully explained.

THE NEFF & FRY CO.
CAMDEN, OHIO

Boiler room where coal flows direct from N & F bins to stokers. No handling. Clean, economical, practical.

they say and do

STANDARDS AND FREE ENTERPRISE

HOWARD COONLEY, Chairman, Executive Committee, American Standards Association, from addresses before Public Relations Executives, the Conference Committee of Staff Executives of ASA Member Organizations, and ASA Company Members Committee

Secretary of Commerce Wallace's letter (to Charles E. Wilson, chairman, Policy Committee of Standards, American Standards Association) proposing that private enterprise assume the primary responsibility for the important function of standardization is a constructive document that has far greater implications than its application to standardization. More than ever before, the United States has become an almost isolated island for free enterprise in a world committed to or experimenting with dictated or government-controlled economies. But the greatest mistake we could make would be to assume that this freedom is a permanent and inviolable inheritance—it is only as safe as free enterprise is adept in solving its own problems. Whenever private enterprise fails to find its own solutions to its problems, it mortgages its future to government.

It is for this reason that Wallace's letter, the first occasion on which government has indicated its willingness to give back to private enterprise some of the freedom it has lost, is of special interest to every individual and every company that is engaged in standardization.

For this reason, too, this letter and the report of the Policy Committee on Standards placed a serious responsibility on the American Standards Association, and on American industry.

The American Standards Association has accepted this responsibility. In doing so it has taken action to speed approval of standards, has made provision for enlarging the ASA Board of Directors to add three members-at-large representing the point of view of the consumer, the retailer, and national publications, and has broadened its scope through a change in its constitution so as to be able to handle standards in any field requiring national standardization. An executive committee has been set up to find ways and means by which the American Standards Association can meet the responsibility it has now assumed.

Within the past year 13 national organizations have joined the American Standards Association, but in order to carry out its new obligations the association must have a greatly enlarged membership and financial support.

The ASA staff must be strengthened and increased to meet the tremendous amount of new work in the engineering field, as well as to take care of the new activity in the consumer goods field. Several hundred standards must be reviewed to determine whether they should now be revised to bring them up to date. Some 150 emergency standards and war standards must be reconsidered and reprocessed to bring them into line with peacetime needs. In addition, requests for work in new fields will require an increase in staff as well as a substantial increase in the budget.

The responsibility for meeting the government's challenge does not lie with the American Standards Association alone.

The story of standardization is the story of management's achievements that make possible mass production Management must meet the government's challenge and, with greater vision than it has shown in the past, make development of national standards a part of the function of industrial management.

Standards in most cases have an important bearing on the public relations of all industries.

Several years ago the American Gas Association brought to the ASA the problem of standards for gas appliances. Through the cooperation of all concerned, there are now American standards for all types of gas-burning appliances and accessories to be found in a well-equipped home. Within two years this led to the redesigning of every gas-fired hot water heater on the American market—for it was found that every one of the former models threw an amount of carbon monoxide into the air which exceeded the standard set for safety and health. Here was a public relations problem of the first order.

On the other side of the ledger, the research and standards work of the program led to more improvements in gas-burning appliances than had taken place in 40 years previously. These included such things as a 50 percent

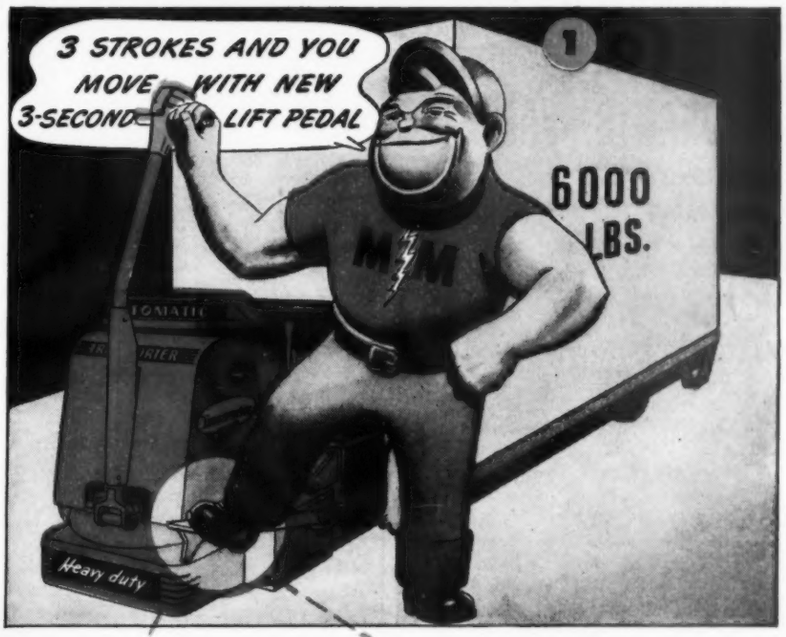
Amazing New Postwar Transporter Lifts Loads Faster... *Moves Loads Easier!*

Adds New Efficiency, Longer Life to Miracle Electric Truck

Yes, you get more—much more in the amazing NEW, POSTWAR TRANSPORTER—the miracle electric truck long famed for cutting handling costs in half and taking the work out of every material moving job.

Astounding new money, time and work saving features have been added. Developments that lift loads faster, move them easier, give longer life and greater efficiency to a unit already noted for energy-saving performance.

With practically everything new but the hardware, the features below only highlight what you will get in the 1946 Transporter. Send the coupon. Get *all* the facts, before you decide on any motorized hand truck.



2 EASY TO GET AT POWER UNIT

Changes in design have been made, so that all parts of the power unit are easily accessible. The wiring system has been simplified, and component parts compactly placed where they can be reached easily for lubrication, and inspection.

3 NEW SAFETY BRAKE

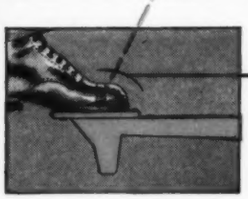
Complete "dead-man" control is assured by a double shoe external contracting type larger diameter brake, which provides four to five times more braking effort. This gives you a Positive Mechanical Brake more efficient and safer the instant control handle is released to upright position.

4 Double-Pitch Reduction Chain Drive Prolongs life of unit.

5 New Magnetic Contactor Utilizes Silver Alloy Tips to give ten times more life.

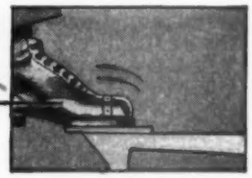
6 Carbon Brushes in Commutator Type Collector Ring Replace Copper Fingers to eliminate lubrication, increase wearing quality.

Approved by Underwriters' Laboratories, Inc.



1 STROKE CONTACTS SKID

2 MORE STROKES LIFT LOAD

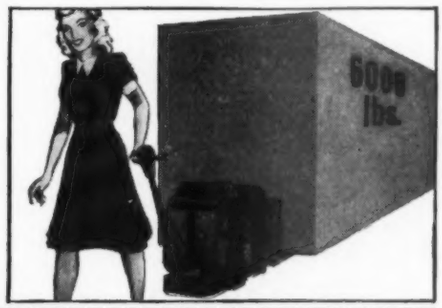


YOU MOVE WITH AMAZING

"TOUCH-OF-YOUR-THUMB" EASE, *says... "MUSCLE MIKE"*

The new 3-second Lift Pedal contains two pistons or cylinders, the high pressure (low speed) cylinder being housed inside the low pressure (high speed) piston. Both cylinders are actuated by the cam when the foot pedal is depressed. One stroke of the foot pedal is all that is required to engage skid.

When load resistance is encountered, the fluid from the larger or low pressure cylinder by-passes back into the reservoir, and the high pressure cylinder is employed to raise the load. So the first stroke of the foot pedal engages the load, and two more strokes raise the load sufficiently to move.



FOOT PEDAL HINGES BACK FOR SHORTER TURNING RADIUS

To provide a shorter turning radius, the foot pedal is hinged back when not in use for lifting.

"Transporter
A PRODUCT OF AUTOMATIC
Lightens LIFE'S LOADS

AUTOMATIC TRANSPORTATION COMPANY
Div. of The Yale & Towne Mfg. Co.
39 West 87th St., Dept. K, Chicago 20, Illinois
Please mail me without cost or obligation, complete facts about the NEW Postwar TRANSPORTER.
( ) Have an A. T. C. Specialist call and survey my material handling costs.
Company Name.....
By.....Position.....
Street Address.....
City.....State.....

LOOK TO THE LEADER FOR ALL THAT'S NEW

increase in the efficiency of the top burners and many other accomplishments in the way of increased efficiency and convenience—another important step in public relations.

At one time there were restrictive ordinances governing the sale and use of gas-burning appliances in some 50 cities. The standards program has led to the elimination of these ordinances which formed trade barriers of some importance, and there is now a pretty free national market for gas appliances unencumbered by local restrictions. Thus, this one program has three accomplishments of first importance in public relations of two industries—the appliance manufacturers and the gas utilities.

DEFINITION OF TERMS

One important form of standards is the definition of technical terms used in industry and technology. We have a technical dictionary of 3500 electrical terms which has come to be looked upon as a sort of bible by the electrical industries. The ASA is now starting a similar project on definitions of textile terms used in the retail trade. This program will be worked out in cooperation with the better business bureaus, which have already accomplished much in this field, together with the other interested groups. One very important term, rayon, has already reached the stage of international discussion with the British.

The British use the term rayon for practically all man-made fibers, such as vinyon, aralac, fortisan, and fiberglass. In such work on definitions, industry has the opportunity to handle one of its important public relations problems, rather than waiting for the problem to drift under governmental regulation. For example, most problems involving the question of truth in advertising are dependent upon recognized definitions of the terms used.

The electrical manufacturers have spent millions of dollars in the development of rules for the rating of electrical machinery, so as to be in position to answer such a simple question as, "What do you mean by a 10-hp. motor?" Formerly, motors marked 10 horsepower actually differed in their capacity by as much as 50 percent. There are now American standards for rating electrical machinery and for many other types of electrical equipment. Some of this work has reached international status.

With the rapid development of newer forms of lighting, such as fluorescent lamps and mercury vapor lamps, a situation could easily develop in which the lamps made by one manufacturer

HYDRANTS, VALVES
Write for catalog No. 34
CHECK VALVE
GATE VALVE
Flush
Used in places where standard hydrant might interfere with traffic or industrial operations. Cast iron nozzle box and cover, with drop handle.
Hydrant
Sets completely underground, accessible by lifting cover. Standard inside construction with a 2½" and a 4" nozzle.

M & H valves are used in industrial plants for water, gas, steam, oil, chemicals and are furnished in all commercial sizes from 2" to 30", inclusive. They are cast iron body, bronze mounted, furnished double disc parallel seat or solid wedge. They are heavily proportioned and have a high factor of safety.

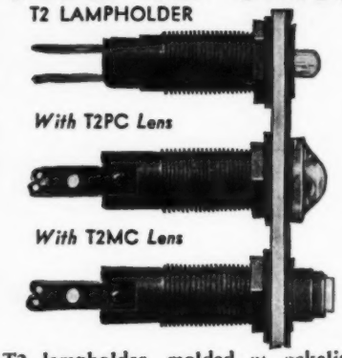
OTHER M & H PRODUCTS

Fire Hydrants, Gate Valves, Tapping Valves, Special Castings, Tapping Sleeves, B & S Fittings, Check Valves, Floor Stands, Extension Stems, Mud Valves, Flap Valves, Sludge Shoes, Flanged Fittings

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

KIRKLAND Pioneer
INDICATING LAMPS

TYPE T2 UNITS



T2 lampholder, molded of bakelite, holding lip, dia. 11/16". Tip of lamp bulb protrudes sufficiently to be removed from front of panel without use of special tool.
Very low current consumption bulb (0.038 max. amp. on 24 volts). Series resistor of small size on 120-220-440 volts, etc.
T2PC Lens-cap, molded in plastic.
T2MC Lens-cap, metal with glass lens.
Write today for catalogue

THE H. R. KIRKLAND COMPANY
King Street Morristown, N. J.

SOLAR
"SHOCKPROOF"
Renewable
CARTRIDGE FUSES

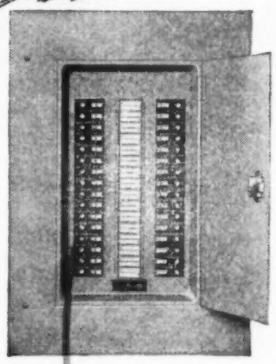
"Quick-as-a-flash" installation of an inexpensive link for the one that has blown — gives you trouble-free plant protection plus economy.

Scientifically designed links eliminate unnecessary blow-outs. Solar is the PREFERRED cartridge fuse—everywhere!

SEND FOR BULLETIN F-7

SOLAR ELECTRIC CORP.
WARREN • PENNSYLVANIA
SALES OFFICE:
110 WILLIAM ST., NEW YORK 7, N. Y.

THERMAL MAGNETIC ACTION



... gives you FASTER MORE POSITIVE CIRCUIT PROTECTION

FA THERMAG

AUTOMATIC CIRCUIT BREAKER PANELBOARD

There is no need to worry about short circuits . . . dangerous overloads . . . burned out equipment . . . and other similar costly and irritating service interruptions . . . with (FA) Thermag Automatic Circuit Breaker Panelboards.

Built from standard units and enclosed in attractive easy-to-install steel cabinets, these modern Underwriters' Laboratory-approved Panelboards are ideal for schools, commercial and industrial installations.

The heart of these modern and efficient panelboards is the (FA) Thermag (Thermal-Magnetic) Circuit Breaker which insures positive circuit protection by combining two important functions in one working unit . . . a thermal action that ignores harmless overloads and temporary surges of current, plus a magnetic action that instantaneously interrupts current at the first sign of short circuit or dangerous overload.

Easy to operate, requiring only the "flip of the handle" to restore service . . . when the trouble is eliminated . . . panelboards with (FA) Thermag Automatic Circuit Breakers are today's answer to tomorrow's service problem. So insist that your next panelboard be an (FA) Thermag Automatic Circuit Breaker type.

(FA) Thermag Circuit Breaker Panelboards are available in standard and narrow column types, also dust-tight and vapor-proof construction panelboards. The type AC Thermag Circuit Breakers are furnished in 15, 20, 25, 35, and 50 amp. capacities for 120 volts AC — single or double pole. Panelboard assemblies have 4 to 42 branch circuits with 115-230 volt, 3-wire, or 120-208 volt, 4-wire solid neutral mains.

For more complete information regarding specifications and costs, write for Bulletin No. 67.

TO RESTORE SERVICE

"Simply Flip the Handle" TO ON POSITION!

(After Removing Cause of Trouble)

EST. THE SIGN OF A (FA) 1891 BETTER JOB

Frank Adam

PANELBOARDS

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

- BUSDUCT
- PANELBOARDS
- SWITCHBOARDS
- QUIKHETER
- SERVICE EQUIPMENT

Here's how CARDOX has Broadened the Scope of CO_2 Fire Protection

Expert fire fighters, who have seen Cardox Fire Fighting Equipment in action against fires normally hard to stop, rate the Cardox method of control and application of carbon dioxide a *significant* contribution to the whole field of fire protection.

By this unique Cardox method, Cardox can engineer many types of fire extinguishing equipment utilizing *low pressure* liquid carbon dioxide in *pounds* or *tons* to provide protection for hazards indoors or out. As a result, the applications for which the recognized advantages of carbon dioxide are now practicable have been multiplied.

For example, Cardox methods of application and control have made it entirely practical to use this fast, non-damaging medium, (1) To provide tons of Cardox CO_2 on a high speed truck to guard widely scattered hazards, (2) To provide a single system capable of protecting multiple hazards throughout large plants, (3) To equip factories, hangars, etc. with a *portable unit* with sufficient wallop to deal with relatively large fires, (4) To protect banks of large transformers outdoors, (5) To overwhelm vicious airplane crash fires fast anywhere on large airfields . . . making possible speedy rescue of plane personnel and salvage of costly equipment.

All Cardox Fire Fighting Equipment has one characteristic: *The distinctive Cardox method of control and engineered application of carbon dioxide stored at 0° F. and 300 p.s.i. in a single storage unit containing from ¼ ton to 125 tons of fire-destroying Cardox CO_2 . . . enough to handle even large fires and leave an ample reserve for new emergencies.*

Mail coupon today for details on how Cardox's broadened application of carbon dioxide can best be utilized to increase the protection of your specific operation. Write for Bulletin 1176.

CARDOX CORPORATION
BELL BUILDING • CHICAGO 1, ILLINOIS
District Offices in New York • Philadelphia
Washington • Pittsburgh • Cleveland • Detroit
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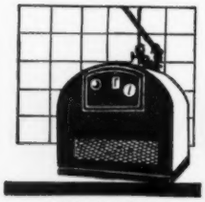


FIXED FIRE EXTINGUISHING SYSTEMS

FIRE TRUCK—Tons of CO_2 on Wheels

AIRPORT FIRE TRUCK

TRANSITANK—Capacity—750 pounds

would not fit the sockets intended for the lamps of a different manufacturer. At the request of the manufacturers the ASA is undertaking to set up standards which will insure continuing interchangeability of the various types of lamps. Since the public will be better served as a result, and since manufacturers of lamps, lamp sockets, and other accessories, and their dealers, will save money by the resulting simplification, this entire project seems to be an example of smart public relations on the part of the group participating in the undertaking.

Through its cooperative efforts the ASA has developed many standards which are used wholly or in part as regulations of state and local governments. Thus, the backbone of the regulations of the state government for the protection of workmen consists of some 80 American Standard Safety Codes.

A similar use of standards is being made in the building code field.

To an industrialist, a sound standard represents the best way of doing a thing at the moment. If tomorrow he finds a better way, he will codify it in a new standard. When properly carried out standardization is dynamic, not static. It means not to stand still but to move forward together.

Whether or not management gives attention to standards and provides for their orderly development is of immense importance to the preservation of our system of free enterprise. For standards are basic controls. They serve as ligaments and tendons in the industrial structure.

Should these controls be taken over by government an important section of the system of free enterprise will have disappeared.

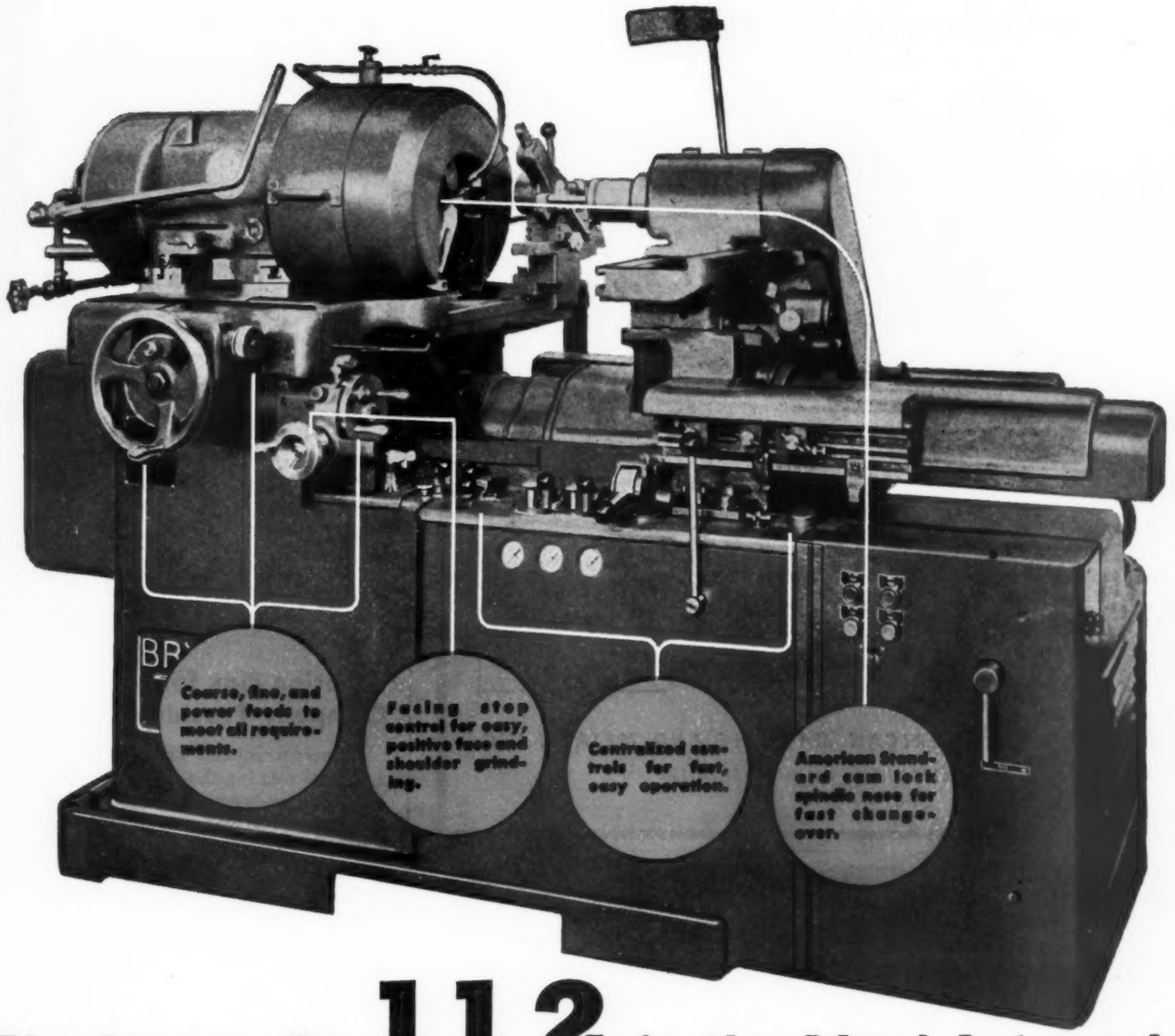
The answer lies with management, for, as Justice Frankfurter once said, "It is too often overlooked that government as a rule undertakes no services or regulations except after private agencies have proved themselves incapable or unwilling."

Guard Against Over-Age Fire Extinguishers

Selection of fire extinguishers, unless obtained directly from their manufacturers or authorized agents, requires special care at the present time, says the Safety Research Institute.

It is pointed out by the institute that some extinguishers, surplus from wartime stocks, are now over-age or were built to conform to substandard emergency specifications.

Some of the models carry only tem-


Coarse, fine, and power feeds to meet all requirements.
Facing stop control for easy, positive face and shoulder grinding.
Centralized controls for fast, easy operation.
American Standard cam lock spindle nose for fast change-over.

The BRYANT NO. 112 is the Ideal Internal GRINDER for Small Lot Production

From stem to stern, the Bryant No. 112 Internal Grinder is designed for small lot production. It is truly the *ideal* tool room machine, because every lever, every control, every part was planned to speed the production of short runs or single parts.

There are three feed controls—one for coarse feed for setup, another for power feed for production, and a third for fine feed for precision.

An American Standard cam lock spindle nose allows fastest change of chucks and holding fixtures.

All controls are centrally located so that all of the operator's motions are easy and natural—more work produced with less fatigue.

A universal facing stop (standard equipment) makes face and shoulder grinding an easy, positive operation.

These are only highlights—for complete details on this "ideal" tool room internal grinder, just . . .

Send for the Man from Bryant.

Write for new catalog on the No. 112

BRYANT

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

PRESSURE, TEMPERATURE, FLOW, ELECTRICAL AND LEVEL MEASURING INSTRUMENTS

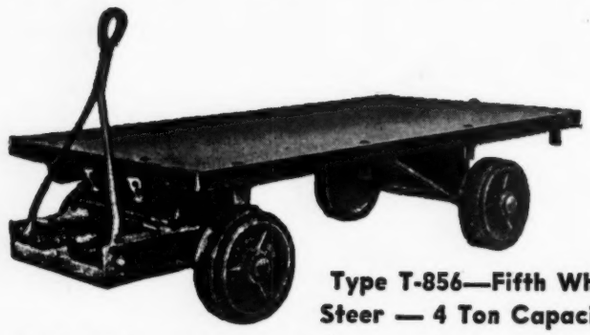
UNITED STATES GAUGE

6 out of 10 manufacturers of original equipment specify U.S.G.

DIVISION OF AMERICAN MACHINE AND METALS, INC.
SELLERSVILLE, PENNSYLVANIA (9)

MERCER
"The Name that Carries Weight"
MATERIAL HANDLING EQUIPMENT

TRAILER TRUCKS



Type T-856—Fifth Wheel Steer — 4 Ton Capacity

Mercer trailer trucks—available in all sizes and capacities. Model shown is built with steel deck. End and side rack sockets. Wheels mounted on roller bearings. Solid or pneumatic tires. Eye drawbar and rear coupler. Designed by engineers whose reputation is founded on doing things right. Literature available. Inquiries invited.

MERCER ENGINEERING WORKS, INC.
Plant: Clifton, N. J.
SALES REPRESENTATIVE
MERCER-ROBINSON COMPANY, INC.
30 CHURCH ST., NEW YORK, N. Y.

porary, approval by the Underwriters' and Factory Mutual Laboratories. These are the substandard devices manufactured as an emergency measure during the wartime shortage of critical materials. They are readily recognized by the letters, "EAS," which stand for "Emergency Alternate Specifications," on the nameplate. Emergency approved extinguishers were not expected to stand up as long as the standard types and by now may be wholly unserviceable.

Other equipment released as surplus, although standard at the time of its manufacture, may now be dangerous to use because of mishandling or improper maintenance since it left the factory. Dents, bulges, signs of corrosion, evidence of soldering or other repairs are indications that the equipment should not be used until it has been properly repaired and tested by the manufacturer.

Rotation Plan for Company Presidents

Numerous benefits are claimed from a plan of rotating the office of company president among a small group of top executives. At the Minneapolis Knitting Works the plan has been in operation for two years.

In this company a policy planning committee has been established consisting of the heads of three divisions: (1) finance and accounting control; (2) production and purchasing: (3) distribution and sales. A fourth, nonvoting, member of this committee is head of a management engineering company which recommended the rotation system. This member acts as management consultant both to the operating management and to the board of directors.

PLANNING COMMITTEE

The purpose and function of the policy planning committee is to review operational problems and progress, and to originate, examine, and develop plans, policies, and financial budgets pertaining to all phases of the business. One member acts as committee chairman, on a rotating basis, and prepares a written report of its discussions, conclusions, and recommendations to the board of directors.

By means of the operation of the policy planning committee, the president and vice-presidents, as heads of operating divisions, have full knowledge at all times of one another's plans, operating program, and progress. Each knows the probable effect of such action on his own division and

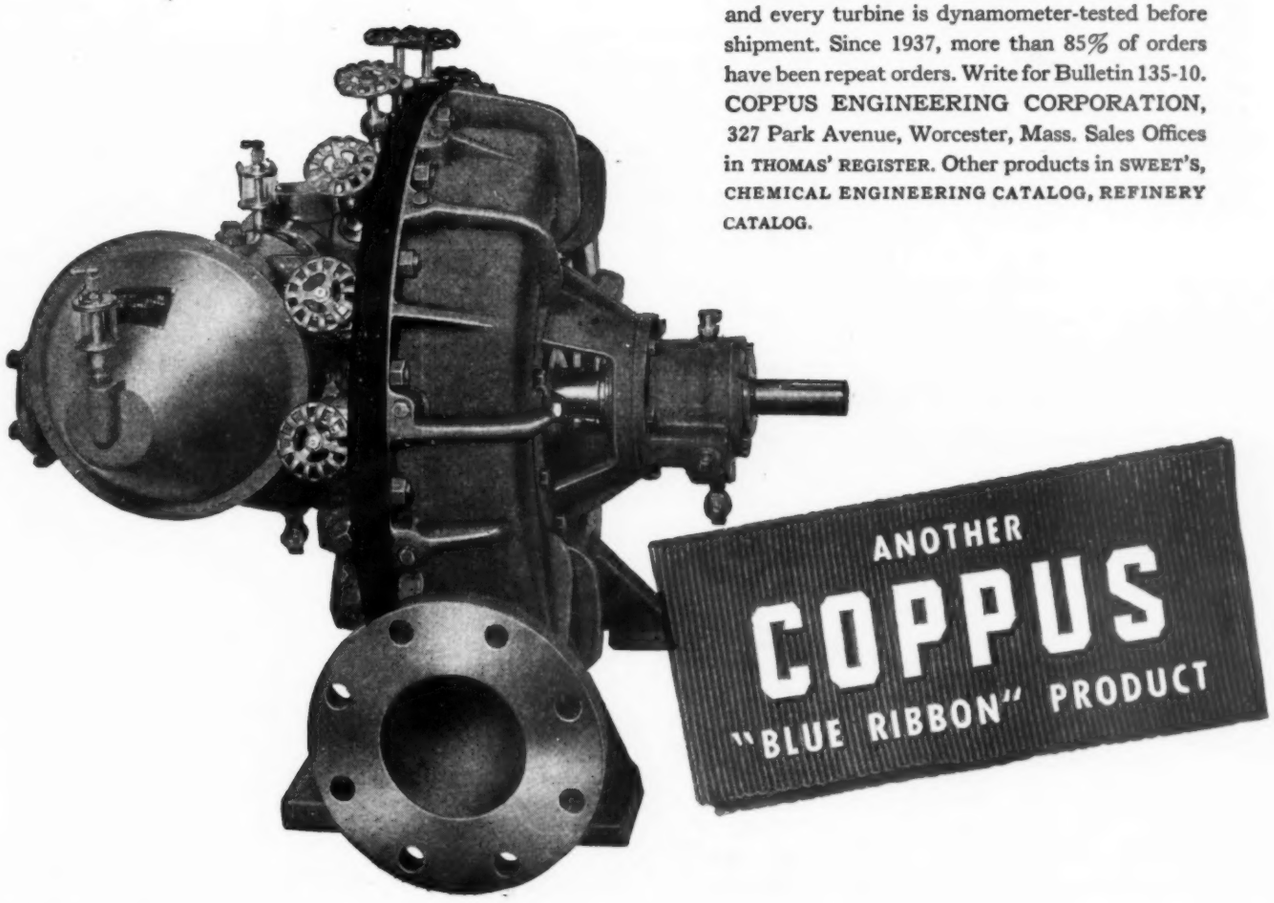
WHEN your equipment calls for small horsepower, you're saving money when a Coppus "Blue Ribbon" Steam Turbine is on the job.

Coppus makes turbines in six frame sizes from 150 HP down to fractional — so you can "fit" the power more closely to the need. No reason to pay extra for ordinary "elephant power" turbines, when you have a small horsepower requirement.

Many well-known manufacturers of original equipment have selected Coppus turbines. And they are to be found on U. S. destroyer escorts, driving vertical lubricating oil pumps . . . on U. S. Casablanca class aircraft carriers, driving main and auxiliary circulating pumps and fire pumps . . . on more than 90% of all Landing Ship Docks, driving condensate and clean ballast pumps.

A job for a Jeep, not a Truck

You, too, can rely on their dependable performance to meet your requirements for "jeep" power. Like all Coppus "Blue Ribbon" products (blowers, ventilators, gas burners, etc.), the Coppus turbine is a precision-made product — its accuracy controlled by Johansson size blocks — and every turbine is dynamometer-tested before shipment. Since 1937, more than 85% of orders have been repeat orders. Write for Bulletin 135-10. COPPUS ENGINEERING CORPORATION, 327 Park Avenue, Worcester, Mass. Sales Offices in THOMAS' REGISTER. Other products in SWEET'S, CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG.



How many wipes in a wiper?

here's why "KEX" WIPING TOWELS have hundreds of more wipes

One look at a KEX Industrial Wiping Towel tells you you're going to get greater performance. Just compare! Every square inch of a KEX Wiping Towel is usable wiping surface—no buttons, hooks, hard seams as with ordinary rags, no loose threads to catch in machinery. KEX Wiping Towels are soft and safe for delicate surfaces—yet tough enough for any job in the shop.

Every KEX Wiping Towel is uniform in size—easier to distribute and keep track of . . . uniform and BIG enough for any wiping job in the plant. And KEX Industrial Wiping Towels are always on hand—delivered as often as necessary—cleaned by a *special* high-heat process. No need for huge piles of inflammables taking up valuable space, creating a fire hazard.

Rent KEX Wiping Towels and Figure Your Profits

Why put up with the inefficiencies of sub-standard wiping materials another day? Install the KEX Wiping Towel system today, improve performance and *save* on wiping costs. There's nothing to buy, no expensive inventory—just a low monthly rental. For complete information, phone your local KEX representative, now—or write KEX National Service, 295 Fifth Avenue, New York 16, N. Y.

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF.

"KEX" REG. U.S. PAT. OFF. NATIONAL SERVICE A CALLAWAY MILLS PRODUCT INDUSTRIAL WIPING CLOTHS

can plan accordingly. Each helps to formulate and develop the policies and operating program of the other divisions, and derives similar help from them. Thus, for example, the production department is constantly integrated with the planned sales program, and both are integrated with an adequate financial program.

The president is simultaneously head of one of the three operating divisions. His regular responsibilities as a divisional manager do not cease when he becomes "president for a year." As president he is, of course, the chief coordinator of agreed-upon policies, plans, and operations.

When a president finishes his one-year term of office, he continues, without any interruption, his duties and responsibilities as vice-president and active head of his own operating division. The vice-president or divisional manager whose turn it is to become the successor-president, is then duly elected to the office of president for the subsequent year.

Each president accumulates, by means of this management plan, an added capacity and stature by virtue of his responsibilities and experience as the continuously active head of his own operating division. Besides doing away with possible dangers of one-man domination, the plan is intended to offer numerous other advantages:

1. It promotes friendly cooperation among the top executives. Each vice-president or divisional manager is willing and eager to help the incumbent president, realizing that it will be his turn to require the cooperation and full support of his associates.

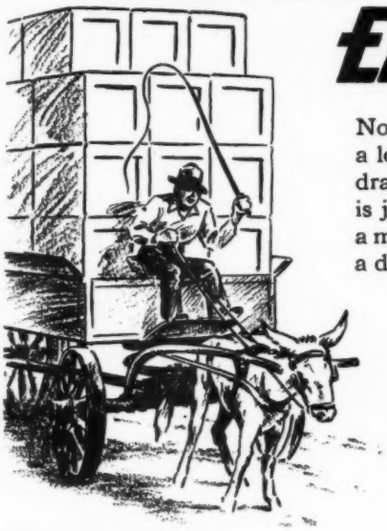
2. The job of the president is made easier. The president is concerned chiefly with insuring a smooth-running, integrated business operation. His other duties as president become relatively minor in comparison with his responsibilities as coordinator and as the active head of his own operating division.

3. The plan avoids stagnation in the office of president, to which the whole organization looks for guidance and leadership, and thus keeps the business alive and progressive.

4. It distributes the burdens of a president and increases the number of competent executives who are experienced in and familiar with the job of president.

5. It provides an ever-ready successor in the event of incapacity or death of an incumbent president.

To get *more* for your valve dollar *consult* POWELL *Engineering*



No one would expect a burro to pull a load that requires a heavyweight draft horse. But a sure-footed burro is just right for carrying a pack on a mountain trail where the power of a draft horse would be wasted.

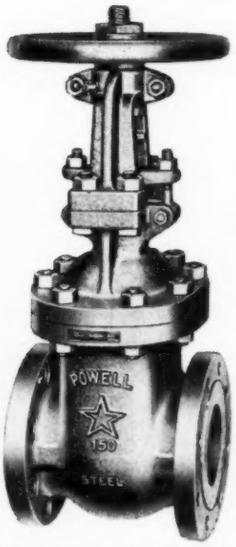
And yet when it comes to valves, such "misapplication" is often encountered. *Many cases of failure are directly due to expecting service from a valve which it was not designed to give.* Consequent replacements are costly. On the other hand, it is not sound economy to use a valve of more expensive construction than the particular service requires. The Powell Line* of Bronze, Iron, Cast Steel and Corrosion Resistant Valves, is so *complete* that there's a POWELL Valve that's *just right* for every flow control condition encountered in modern industry. When you need valves for new installations or for replacements, don't risk "misapplication". Consult POWELL Engineering and *get more for your valve dollar.*

The Wm. Powell Company, Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

*In writing for catalogs kindly specify the service conditions under which the valves, in which you are interested, must operate.

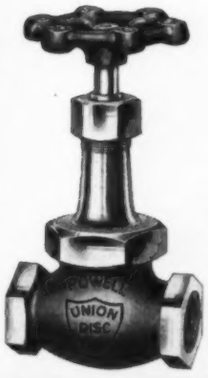
Large Iron Body Bronze Mounted Gate Valve for 125 pounds W. S. P. Made in sizes 2" to 30", incl. Has flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc. Taper wedge double discs can be provided in sizes 2" to 12", incl. Seat rings and stem are bronze. Disc is bronze in 3½" and smaller size valves and bronze faced in the larger sizes. Also available in All Iron for certain services.

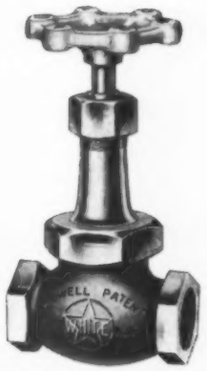


Class 150-pound Cast Steel Gate Valve. Has flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc. A sturdy valve, designed for services in which bronze or iron valves are inadequate. Powell Cast Steel Valves of all types are available in pressure classes from 150 to 2500 pounds, inclusive.

Small "Y" Valve for 150 pounds W.P. Made in sizes ¼" to 2", incl. Has flanged ends, bolted flanged yoke, outside screw rising stem and plug type disc. This is one of many special Powell designs for handling corrosive media encountered especially in the chemical and process industries. Available in a wide range of corrosion resistant materials.

Small Bronze Globe Valve for 150 pounds W. S. P. Made in sizes ⅛" to 3", incl. Has screwed ends and union bonnet. Regularly furnished with renewable vulcanized composition disc for steam service, but special discs are available for other services.





Small Bronze Globe Valve for 200 pounds W.S.P. Made in sizes ¼" to 3", incl. Has screwed ends, union bonnet, renewable, specially heat-treated stainless steel seat and regrindable, renewable, wear - resisting "Powellium" nickel-bronze disc. A long-life valve, designed to stand up under severe service conditions.

POWELL VALVES

88%
EASIER
LIFTING

It's a fact that

SIMPLEX BALL-BEARING
SCREW JACKS

. . . reduce effort 88%. Self-leveling cap floats 9 degrees on *single* chrome-moly steel ball. No ring of small balls to flatten when load is not centered. Operator output boosted.

It pays dividends having plenty of Simplex Screw Jacks—moderate cost. 19 sizes with 4-way head, 9 sizes with ratchet head. 5 to 24 tons capacity.

TEMPLETON, KENLY & CO.
Chicago 44, Illinois

BETTER, SAFER JACKS SINCE 1899

SIMPLEX
WORLD'S MOST COMPLETE LINE OF
JACKS
LEVER
SCREW
HYDRAULIC

Behind the Byline

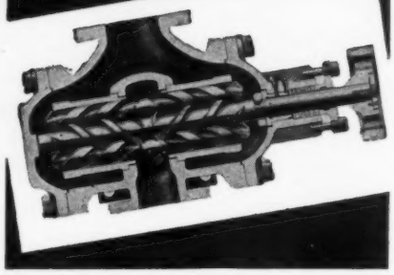
Facts About *Factory's* Authors

The special interest of Kenneth G. Freeman (page 92) is the future development and application of three-dimensional scale models to industrial and civic use. He would like to see even small communities make greater use of this form of graphic presentation in planning new business and residential areas. His hobbies include small boat sailing and racing, photography, fishing, gardening, and his two youngsters, Nancy and Jerry.

The dramatic appeal of firefighting is always high, but in industry fire protection is even more important. Add to this an element like magnesium, which has untamable fire properties, and one has the ingredients for an article such as the one contributed by Norman J. Thompson, (page 126) president of Factory Mutual Research Corporation. In recent years Thompson's work has been tests, research, and development to protect American industry against losses from fire, explosions, and accidents. He holds a B.S. degree in electro-chemistry from Massachusetts Institute of Technology. He belongs to the American Chemical Society, National Fire Protection Association, and the American Association for the Advancement of Science. Aside from his professional activities, it's golf in fair weather, classical music at other times.

P. H. Curtiss, Sr. (page 89) obtained his first factory job at Ford's plant on Piquette and Beaubien Streets in Detroit. That was in 1905. He drilled holes in auto frames supported on a pair of wooden sawhorses. Entire production in a day was five cars, which had copper water jackets around the cylinders and antedated the famed Model T. Thus in his own experience Curtis has lived the dramatic story

NO GEARS



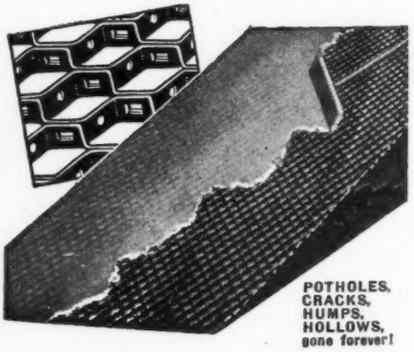
The IMO PUMP requires no gears, because the fluid pumped is propelled from suction to discharge by the action of three intermeshing rotors. That's all there is to it—no gears, valves, vanes or pistons!

For simplicity, reliability and compactness select the IMO—for use in hydraulic service, governor service, lubrication service and other fluid handling services.

For further information send for catalog I-132-J

IMO PUMP DIVISION of the
DE LAVAL STEAM TURBINE CO.
TRENTON 2, NEW JERSEY

Here's the way to make
an
Enduring LEVEL FLOOR
KLEMP Hexteel
with
Heavy Duty Surface Armor



Easily, quickly applied. Fill HEXTEEL even with top of mesh with concrete or mastic, and you have a solid level floor for longest severest use. *Lowest Maintenance cost.* Exposed steel bearing surface of HEXTEEL defies heaviest traffic. Use HEXTEEL also to repair old floors.

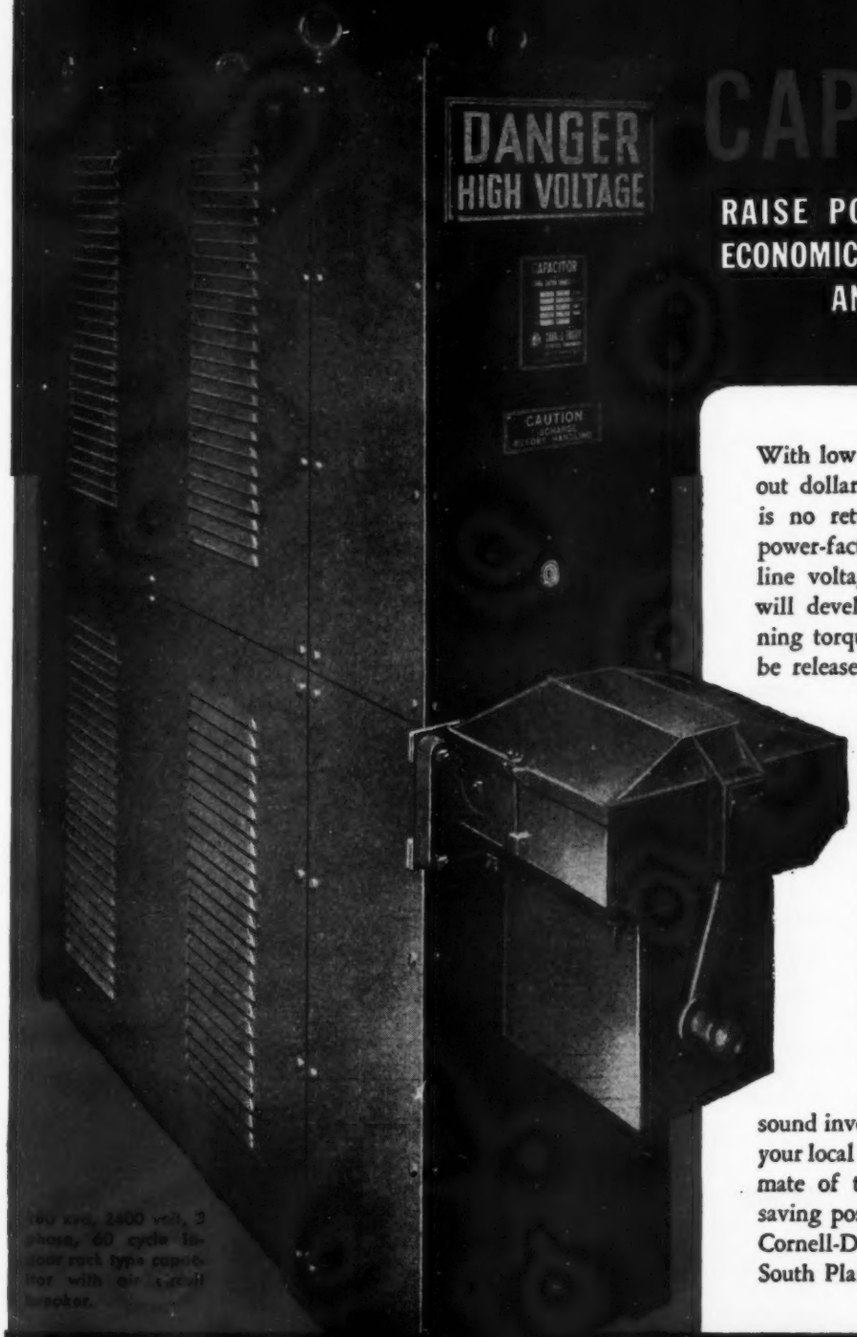
Send for Klemp Catalog.

Shows Hexteel, Klemp Acme Florsteel, Open Steel Gratings, Steel Stair Treads, etc. Wire or write.

WM. F. KLEMP COMPANY
"Steel Flooring Specialists"
6616 S. Melvina Ave. Chicago, 38 Illinois

IT PAYS TO BUY EQUIPMENT THAT PAYS FOR ITSELF

C-D CAPACITORS



RAISE POWER-FACTOR QUICKLY, ECONOMICALLY—LOWER OPERATING AND POWER COSTS

With low power-factor you are paying out dollars and cents for which there is no return. With C-D Capacitors, power-factor can be improved quickly, line voltage drop is reduced, motors will develop rated starting and running torque, and, feeder capacity will be released for additional equipment.

Cornell-Dubilier Capacitors are easily obtained and installed. They can be positioned where needed—readily moved to other locations. Average costs, installed, are from $6.15 per kva to $13.00. Saving on down-time, improved efficiency, combined with economies in demand charges soon pay for the capacitor installation. C-D power-factor improvement capacitors are a sound investment—not an expense. Ask your local C-D engineer for a quick estimate of the increase in capacity and saving possible in your plant, or write Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey.

Cornell-Dubilier *World's Largest Manufacturer of* **Capacitors**

The DRACCO System shown above unloads eleven tons in an hour and thirty minutes and conveys the material to the third floor. Many such installations, handling chemicals, grains and granular materials, are saving hours, manpower and dollars every day. A DRACCO Pneumatic Conveyor and ONE man often replaces SEVERAL men, and will do a much better job than is possible with obsolete handling methods. Why not let DRACCO Engineers check your present material handling methods for you? They have more than 30 years' experience in reducing the cost of handling many materials.

For Further Information Write

DRACCO CORPORATION

4091 E. 116th St., Cleveland 5, Ohio New York Office: 130 W. 42nd St.

DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

of modern industry and has bridged fully the span from the beginning of the production line to the intricate and highly mechanized methods used at the Buda Company, where he is general superintendent. In 1907 he enlisted in the Marines and sailed around the world with the battleship fleet. He served in the Philippines and two years in Peking, China. From 1911 on he has been associated with various car and motor manufacturers. He is an active leader of Boy Scouts, and his hobbies are hunting and fishing.

Self-evident and conclusive, the record shows that W. E. Blewett (page 132) is well acquainted with the stepladder value of incentives. He is Chairman, Lower Peninsula Planning Commission; Past-President, Propeller Club; Past-President, James River Country Club; Vice-president, Virginia State Golf Association; Past-Commander, American Legion Post, No. 25. A graduate of Cornell University, he started as a draftsman with the Newport News Shipbuilding & Dry Dock Company and is now vice-president and production manager. He is a member of the American Society of Naval Engineers and the Society of Naval Architects and Marine Engineers. His hobbies are golf, hunting, and fishing.

Author of books on engineering and industrial management, Ralph M. Barnes (page 145) is professor of industrial engineering and director of personnel of the College of Engineering, University of Iowa. He received his M.S. and Ph.D. degrees from Cornell University. Since 1939 he has been director of the Iowa Management Course, and during the war served as consulting engineer for leading industrial organizations. He is a member of the ASME Work Standardization Committee and the Society for the Advancement of Management Committee on Rating of Time Studies; also the American Management Association, the Society for the Promotion of Engineering Education, Institute of Industrial Psychology of Great Britain, and the American Association for the Advancement of Science.